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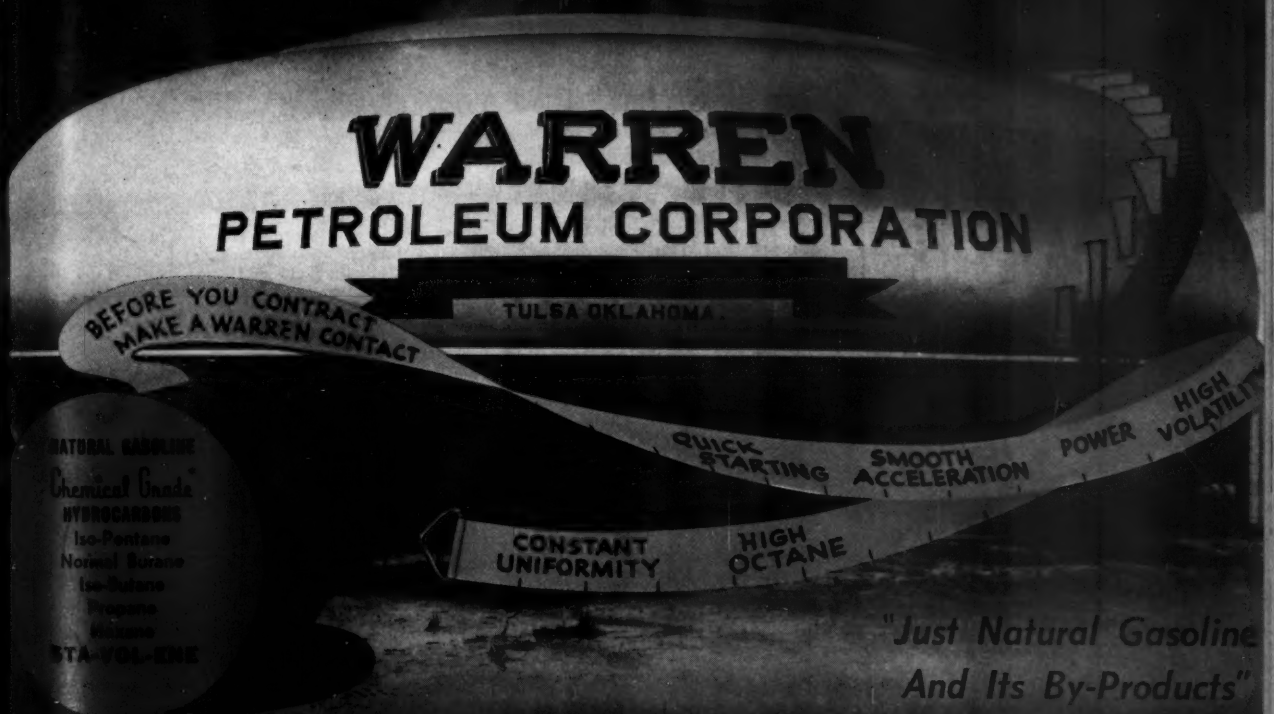

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Warren Petroleum Corporation

"Just Natural Gasoline and Its By-Products"

Tulsa 2, Oklahoma

SILVER ANNIVERSARY 25 1923 YEAR 1947

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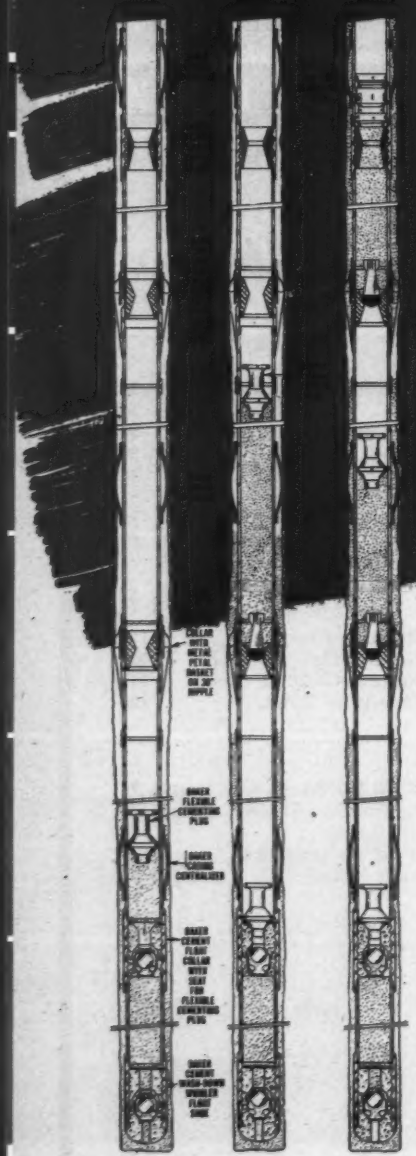
FOR MULTIPLE-STAGE JOBS...



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THE OIL AND GAS JOURNAL

Industrial Relations

THE demands of many CIO oil unions for substantial increases in wages and the Los Angeles sessions of the Industrial Committee on Petroleum of the International Labor Organization are again spotlighting labor's position in this and other oil-producing countries.

Organized labor in this industry has not made clear on what it bases its latest demands and probably will not—attempting again to carry out a policy inaugurated in the fall of 1945 of accomplishing its objectives by confusing issues and through intimidating actions which are a threat to the entire national economy.

The top position of petroleum as regards wages has not changed. According to the U. S. Department of Labor reports for October last year, the latest complete information available, the weekly average for all manufacturing was $45.08 and the hourly rate was $1.13. In the nondurable division of manufacturing to which petroleum belongs, the weekly average was $42.42 and the hourly rate was $1.055.

In contrast the weekly rate in petroleum refining was $57.39 and the hourly rate was $1.438. These represented gains over October 1945 of 8 per cent in weekly wages and 11.4 per cent in hourly rate.

Comparisons based on average rates reveal only part of the exceptionally favorable position of those employed at more than 400 refineries operating 24 hours daily throughout the year. The petroleum industry leads in insurance, retirements, vacations, and other special provisions for employes. Working conditions far exceed the average, with employment not subject to seasonal fluctuations. Employment conditions in petroleum production and pipe-line operations are similar to those in petroleum refining.

These are facts which should be controlling in determining union wage policies for another period. Certainly with this record management should not permit itself to be maneuvered into a defensive position by labor leaders whose methods have weakened labor's position on many fronts.

So far as the principles guiding employers in their relations with employes are concerned, they were again clearly stated at the Los Angeles meeting. Employers to fulfill their duties to employes, consumers, and investors must not be subject to undue restriction and interference. Wage scales must be established with due regard to the skills involved and the general average of rates in other industries.

Both sides must be free to enter into collective bargaining, and the agreement once entered into must be respected by employe organizations as well as employers. Finally, there must be a recognition of the fact in all negotiations that "sound industrial relations and industrial peace are only slightly less important than peace among nations."

Panhandle Asks Court to Set Aside Michigan-Wisconsin Order

WASHINGTON. — The controversy between Panhandle Eastern Pipe Line Co. and Michigan - Wisconsin Pipe Line Co. over which one should serve expanding natural gas markets in the Detroit area was taken to the courts February 7 when Panhandle petitioned the U. S. Court of Appeals in the District of Columbia to set aside the November 30 order of the Federal Power Commission granting a certificate to Michigan-Wisconsin.

On the following day the commission released its opinion in this case, delay of which is one the points cited by Panhandle in alleging error. The majority opinion does not go much further than the original order in explaining the commission's reasons for ruling that Panhandle's "grandfather" certificate does not give it exclusive rights to service Detroit. However, Commissioners Olds and Draper, in separate dissenting opinions, vigorously defended the grandfather clause of the Natural Gas Act as prohibiting FPC from permitting a second line to be built into an area served reasonably adequately by an existing line.

Interpretation of the grandfather clause is one of the principle requests made of the court, but Panhandle also charges FPC acted illegally in delaying its opinion for more than a few days after the order and in its action in the interim. Within the 30-day legal period following the order, Panhandle asked FPC to reopen the case for further evidence, but this was denied as premature with the explanation that the 30-day period does not begin to operate until the opinion is released. Panhandle told the court that if this is so then the November 30 order was not a legal and valid certificate. If the certificate was not valid on December 1, it is declared then Magnolia Petroleum Co. and Stanolind Oil & Gas Co. were within their rights in cancelling on that date their contracts to supply gas to Phillips Petroleum Co. since these contracts permitted cancellation if Michigan - Wisconsin did not have a certificate by December 1. Panhandle told the court that the Magnolia and Stanolind Gas were so important to the Michigan-Wisconsin plan that FPC must reopen the case to take additional evidence on this point if the November 30 order was not a valid and final certificate.

Mediators Enter California Dispute

OIL-COMPANY management officials in California and representatives of the Oil Workers International Union this week were called into a meeting with a mediation board of the Federal Conciliation Service in an effort to iron out the current West Coast wage dispute.

E. P. Marsh, regional director of the Conciliation Service in Los Angeles, said he set up the board to hear the case without a request from either party. He pointed out serious effects which would result from widespread oil strike on the Pacific Coast.

The union several weeks ago filed strike notices under the Smith-Connally Act, naming 63 California companies. J. E. Brown, district director of the O.W.I.U. in Bakersfield, Calif., last week left a union policy committee meeting in Fort Worth with what union officials said were instructions to shut down the California industry February 15. The union is charging failure on the part of the companies to engage in "effective bargaining."

The union's weekly this week said plans were complete for a shutdown of operations. The paper said the companies have offered a variety of bonus plans, none of them acceptable to union membership. The union said some 17,000 workers were involved in the dispute on the West Coast.

A statement issued following the policy committee meeting in Fort Worth said the C.I.O. oil workers organization was "prepared to take whatever action is needed. . . . on the union's request for a 25-cent-a-hour increase." A union official added the O.W.I.U. would not violate its many contracts with no strike clauses. The Fort Worth meeting approved the 25-cent-an-hour wage increase offer of E. B. Hall & Co., Long Beach, Calif., which provided for reopening later on the basis of whatever wage agreements may be reached later.

Miller Named Secretary

AUSTIN.—K. C. Miller, Austin, has been named secretary of the Texas Railroad Commission, succeeding L. D. Ransom, Corsicana, who is secretary to Gov. Beauford Jester. Miller has been employed by the Oil and Gas Division of the commission since 1942.

Supreme Court to Review Interstate Natural Case

WASHINGTON.—The Supreme Court of the United States agreed Monday to review the decision of the Fifth Circuit Court of Appeals in upholding the order of the Federal Power Commission against the Interstate Natural Gas Co. of Louisiana. This was a reversal of its action of January 6 in denying the company's petition for review. (The Oil and Gas Journal, January 11, page 38). No reason was given for the action.

Review of this case is considered by the gas industry as highly important since it appears to give the power commission very wide authority over production and gathering of natural gas. FPC had ruled that since the company is subject to its jurisdiction because of other operations it must submit to FPC regulations of the rates at which it sells gas produced and delivered in Louisiana but destined for transmission to other states by other companies.

West Edmond Gas-Oil Ratio of 4,000-1 Asked

OKLAHOMA CITY.—The Oklahoma Corporation Commission last week recessed its hearing on a proposed change in the gas-oil ratio in West Edmond field after Walker T. Pound, state conservation officer, recommended a production ratio of 4,000 cu. ft. of gas to 1 bbl. of oil.

Pound told the commission a 2,000-to-1 ratio would result in the recovery of more oil but that a 4,000-to-1 ratio would be "more reasonable because it protects correlative rights."

H. H. Kaveler, petroleum engineer, Phillips Petroleum Co., told the commission there would be no need for a limiting gas-oil ratio with unitized operation since gas then would be used in the most efficient manner to get production of oil.

The commission continued the case until March 5. On March 18 the commission will conduct a hearing on the application of a group of West Edmond operators for unit operation.

South Penn Oil Sets Up Basic Research Program

A program of cooperative fundamental research with the mineral industries experiment station of Pennsylvania State College has been established by South Penn Oil Co. The program will emphasize water-flooding projects and will be a part of the station's over-all program aimed at increasing crude-oil recovery in the Bradford and Allegany districts.

New Company Headed by Poe Bids $143,127,000 for Big Inch

WASHINGTON.—The Texas Eastern Transmission Co., a new corporation headed by E. Holley Poe, was the apparent high bidder for the Government's Big Inch and Little Big Inch Pipe Line systems when bids were opened by War Assets Administration February 10.

The Poe firm bid $143,127,000, considerably higher than any of the five other bids which, at the public reading, appeared to meet all requirements of the bid form. In addition there were several other offers and communications which were not accompanied by the required $100,000 earnest money and in other ways did not comply with the terms of bidding.

WAA officials announced that an analysis of all bids would be published and given careful study before an award is made.

The second highest bid was from Claude A. Williams of Austin, Tex., and associates, who offered $131,000,000 to use both lines for gas. Williams submitted a second bid of $121,000,000 for a plan to use the Big Inch for gas to the Atlantic Seaboard and the Little Big Inch for crude oil from Texas to Toledo, Ohio, and other Midwest refinery points.

T. G. & T. Bid

Tennessee Gas & Transmission Co., now operating the system on an interim lease, bid $123,700,000. This company was not among the bidders last July.

Big Inch Gas & Oil Co. bid $108,031,660. This concern was formed of two former companies, Big Inch Oil, Inc., and Big Inch Gas, Inc., by Charles H. Smith of New York, and others, including officials of Southern Natural Gas Co., who last summer offered $110,000,000 of which $44,000,000 was in the form of income bonds.

Among other bids which were not accompanied by the required $100,000 deposit were offers of $120,000,000 from Russell Palmer, former official of Lago Oil & Transport Co., Ltd., and Creole Petroleum Co., who in July offered $135,000,000; George J. Callahan of Brighton, Colo., not a previous bidder, $6,100,000; and J. W. Crotty and associates, Dallas, who in July offered $127,500,000 but who this time submitted a bid of 60 cents for the Big Inch and 40 cents for the Little Big Inch, and who pasted a dollar bill to his bid with the statement that this represents the full value of the lines at present.

All the high bidders asked the option of using either or both lines for petroleum or natural gas, but except for Williams' alternative bid it was obvious that the intention was to use both lines to carry gas to the Eastern Seaboard.

Texas Eastern Transmission Co. was incorporated in Delaware January 30, 1947, with office in the Esperson Building, Houston. Officers and principal stockholders include E. Holley Poe and Hilding Carlson, New York; E. DeGolyer, Dallas, and George R. Brown, Herman Brown, Charles I. Francis, and Herbert J. Friendly, Houston.

The bid stated that initial financing has been completed, with 150,000 of $1 common stock already sold. Manufacturers Trust Co. of New York and City National Bank of Houston have made a commitment for a bank loan of $4,000,000 and Dillon, Reed & Co. have approved a plan for further financing and agreed to underwrite the securities. The bid stated that ultimately Texas Eastern Transmission Co. will be publicly owned. While stating that a portion of the system may be used for petroleum if economically feasible, the bid declares that the objective is to transmit natural gas from Texas to the Atlantic Seabord. Initially under an interim lease substantially similar to that of Tennessee Gas & Transmission, and ultimately to full capacity of 425,000,000 cu. ft. daily. R. H. Hargrove, of United Gas Corp., will take a leave of absence from that company to direct reconversion of the Big Inch system for Texas Eastern, of which he is also a stockholder, the bid stated.

Last July Poe bid $80,000,000 cash or $260,000,000 for a 40-year lease.

Poe said Tuesday in Washington he is confident Pennsylvania will not attempt to block Big Inch movement of natural gas through the state. Though some state officials have indicated they will seek to prevent Big Inch use for gas in Pennsylvania, Gov. James H. Duff told a news conference he did not think any state could halt the movement of a commodity in interstate commerce.

Busy drafting bylaws and a constitution are the newly elected temporary officers of the Tulsa Geophysical Society, the first local section formed under the national organization, the Society of Exploration Geophysicists. Permanent officers of the society, formed at a recent meeting of 60 geophysicists, will be elected at a second meeting March 13. In the picture are, seated, Colin C. Campbell, business manager of the national society, secretary, and E. Jack Handley, Century Geophysical Co., vice president and member of the drafting committee. Standing are Stanley W. Wilcox, Seismograph Service Corp., member of the drafting committee; V. L. Jones, University of Tulsa, member of the drafting committee; and R. Clare Coffin, Stanolind Oil & Gas Co., temporary president

Subcommittees Study Oil Labor Problems at ILO Meeting

LOS ANGELES.—Closing sessions of the Industrial Committee on Petroleum of the International Labor Organization were held here this week with the delegates, representing 12 countries, occupied principally with the recommendations of three subcommittees which have been at work for several days on the real business of the meeting.

Early this week one of the subcommittees agreed to recommend the principle of a minimum wage for oil workers throughout the world. The proposel mentioned no amount but provided a wage floor should be set in each country by collective bargaining, legislation, or other means.

Earlier in the conference, a deadlock developed over the question of recommending a 40 or 48-hour maximum work week in the international oil industry, and the subject was passed over until a future meeting of the committee.

Other subcommittee actions called for: continued harmonious relations between employers and employes, right of workers and employers to free expression and to form organizations "of their own choosing without discrimination"; basic education for oil workers' children through company - government programs; vocational training within the industry; and an ILO study of facilities for extending technical and vocational training outside the industry.

Prominently identified with the conference were James Tanham, vice president of The Texas Co., and Charles Shaw, overseas director of industrial relations for Standard Oil Co. (N. J.), who early in the conference was elected chairman of the management group. Government management, and labor in each country sent two delegates each.

Speaking before a plenary session of the conference Shaw said the employer delegates "have formulated the following brief statement of basic principles, to which we all subscribe:

"1. The employers have a sincere desire to make our contribution to the objective of maximum productive employment in the world as a whole by doing all within our power to insure that oil in sufficient quantity and at fair prices is available for the development of industry and for private use.

"This can be achieved only under conditions which permit of progressive exploration and of sustained and economic production and manufacture. Such conditions require that management, in the interest of those employed in the industry, the consuming public, and the investors, shall have freedom to fulfill their duties of directing the enterprise without undue restriction and interference.

"2. We believe unhampered negotiations between free labor and free management is the best method to make collective bargaining effective over an extended period. Agreements reached in good faith through collective bargaining must be equally binding on both parties.

"3. We believe that if the world is to go forward in providing a better living for all, sound industrial relations and industrial peace are only slightly less important than peace between nations."

Dr. Jose Diaz Grandados, Colombian Government representative, told the conference his country welcomed foreign capital, provided Colombian workers were treated with dignity as citizens of a democratic country.

Subcommittees whose recommendations will largely constitute the accomplishments of the conference, spent the week working on these three topics: (1) General social and labor conditions; (2) machinery for management-labor relations; (3) vocational training.

Such of their recommendations as are passed on by the conference will be transmitted to the governments of the 12 countries represented at the conference, to organizations of workers and employers in each country and to the governing body of ILO.

Monday the delegates were guests of the Western Oil and Gas Association on a tour of southern California oil fields.

United States delegates of the conference, in addition to Shaw and Tanham were:

Government: John A. Loftus, chief of the State Department's petroleum division, and John Pierson, economic adviser to Davis A. Morse, assistant secretary of labor.

Labor: Herbert Woods and H. M. McNeel, of the International Union of Operating Engineers (A. F. of L.).

Dinner to Honor Murray

William M. Murray, new Texas Railroad Commission member, will be honored at a dinner in the Rice Hotel in Houston February 18. The dinner, arranged by a group of Houston oil men, will follow the first state-wide proration hearing the same day in the Rice Hotel.

Compact Plans Research In Secondary Recovery

The sum of $15,000 has been allocated by the executive committee of the Interstate Oil Compact Commission to finance a division which will study and promote secondary recovery research. The division will be set up in the commission's headquarters offices in Oklahoma City.

A special stripper well committee, authorized at the December meeting in Dallas, will be appointed soon by Chairman Hiram M. Dow to make a thorough study of stripper well operations particularly as they may affect secondary recovery work.

Four-year extension agreements for the compact, which will expire September 1, are expected to be signed soon by officials of affected states. Oklahoma became the first state to extend the compact's life when Gov. Roy J. Turner signed the extension agreement early this month. Legislation to continue the agreement in effect is pending in Texas, Kansas, Illinois, and Michigan, the only four states in which the governor does not have power to extend the agreement.

The compact has scheduled its first meeting ever held in Alabama with the spring quarterly session to be in Birmingham April 24-26, Dow said.

Nassau, McAlester Fuel Oil Buy East Texas Wells

FORT WORTH.—William Fleming and associates last week announced the sale for $11,200,000 of 141 producing wells in East Texas field to Nassau Associates, Inc., New York, and J. G. Puterbaugh, McAlester, Okla., president of McAlester Fuel Oil Co.

Of the 141 wells, 120 are in Gregg County and the others in Rusk County. A pipe-line gathering system was included in the deal. The properties will be operated by the McAlester firm.

Controls Removed From Many Export Products

Many petroleum and related products are included in a list of approximately 50 items removed last week by the Department of Commerce from the list of commodities subject to export control.

Included in the list were: residual fuel oil, carbon black or gas black (except channel-type carbon black), butyl cpolymers of isobutylene and isoprene or other diolefins, reclaimed rubber, conveyor belting of rubber, balata, or synthetic rubber, kerosene room heaters, and gas and oil-range and stove parts.

——this week

BIG INCH— New company, Texas Eastern Transmission, headed by E. Holley Poe, bids $143,127,000 for the Big Inch system at the second opening of offers by WAA in Washington. . . . Offer is apparent high of the six bids meeting requirements. . . . All offers but one aim at use of the lines to move natural gas. . . .

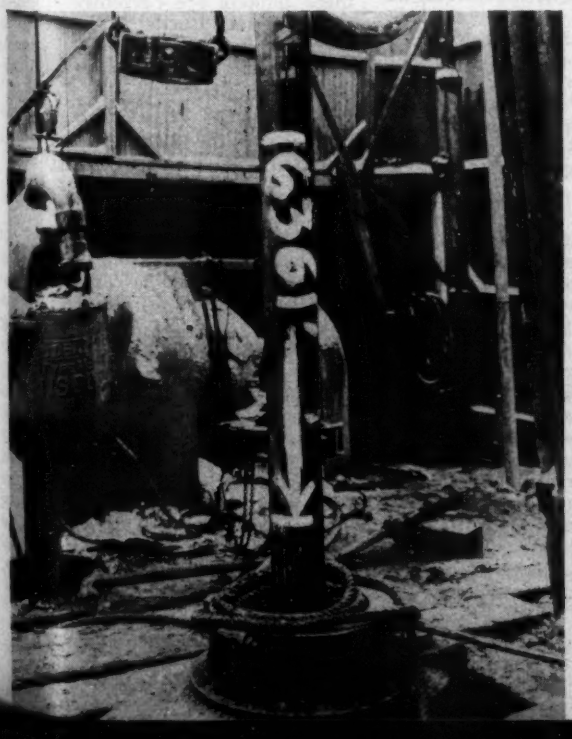
NATURAL GAS— Panhandle Eastern Pipe Line goes to court with its fight against the FPC order allowing Michigan-Wisconsin Pipe Line to enter the Detroit market area. . . . Panhandle files in U. S. Circuit Court in Washington asking the order of November 30 be set aside.. . . ¶U. S. Supreme Court reverses previous ruling and agrees to review Circuit Court decision in Interstate Natural Gas case. . . . ¶Memphis Natural Gas files with FPC a proposal to build a 24-in. line from East Texas to Pittsburgh at an estimated cost of $63,000,000. . . . Work would be delayed about 2 years by pipe shortage. . . . ¶Cold wave through East causes severe gas shortage. . . . Curtailed industrial deliveries force shutdown of many plants. . . .

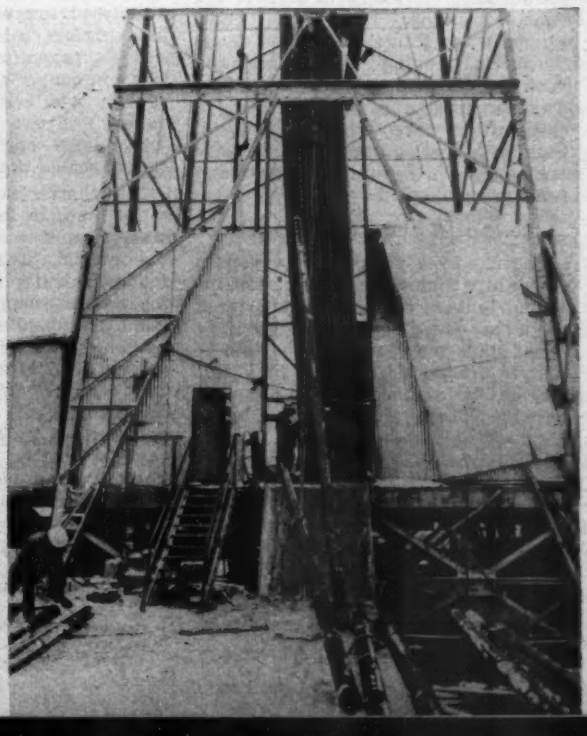
GOVERNMENT—Senator O'Mahoney's attack on pending purchase by Jersey Standard and Socony-Vacuum of share in Arabian American draws comment from company spokesman that charges are inconsistent with recommendations of his special Senate committee. . . . State Department official says department has no present policy governing participation of U. S. companies in foreign operations on block basis. . . . O'Mahoney's charges of a likely foreign oil monopoly viewed as one indication the coming Anglo-American treaty hearings may develop into a general investigation of international oil activities. . . . Hallanan names NPC committee to study nation's capacity to produce aircraft fuels. . . . Krug names C. L. Henderson, Wichita, to NPC, and indicates he will appoint one or two independent retailers before next quarterly meeting. . . .

ACQUISITIONS— Sun Oil buys tract near Sarnia, Ont., to be used, unofficial reports say, as site for new refinery. . . . ¶McAlester Fuel Oil, Nassau Associates, Inc., buy 141 producing wells in East Texas field from William Fleming and associates for a reported $11,200,000. . . . ¶Calumet Refining, Chicago, announces acquisition of Princeton Refining, Princeton, La. . . .

LABOR— Oil union declares readiness to carry out California strike this week if agreement is not reached. . . . U. S. mediation board studies dispute. . . . ¶O.W.I.U. get additional 7-cent hourly wage increase from Sinclair as a result of increase in Bureau of Labor statistics living-cost index. . . . ¶Subcommittees study a variety of proposals to improve labor-management relations at ILO conference in Los Angeles. . . .

The world's longest string of 7-in. casing ever set successfully—16,361 ft. of it—was in the hole when the picture at left was made during cementing operations at Superior Oil Co.'s deep test near Fort Cobb, Okla. Picture at right was made as the last few lengths of casing were hoisted into the derrick. The test later was held up at 16,691 ft., 23 ft. below the world's record depth, for repairs on the draw works. The casing was run slowly and touched bottom 27 hours and 15 minutes after the casing shoe was started into the well. The string was run under the supervision of John Cody, Superior's general superintendent; R. A. Heckel, National Supply Co. rotary representative; and N. A. Rebarick, Spang-Chalfant field engineer. (The pictures, courtesy National Supply)





Government's Tanker Fleet Faces Idleness Unless Congress Acts

by Henry D. Ralph

WASHINGTON.—The Government's fleet of 240 oil tankers now operating in all parts of the world will be laid up abruptly at end of this month unless Congress takes action meanwhile to continue the authority of the Maritime Commission to operate them on a voyage-charter basis.

These tankers are operating in domestic service on both the East and West coasts, on foreign routes taking petroleum products to the Army and Navy in occupied areas, to foreign governments, and for private account. In total they are moving some 20,000,000 bbl. of oil per month. To lay them up would cause severe oil shortages in many areas.

These are war-built tankers operated by the Government under authority of Title I of the Second War Powers Act, which expires March 31. President Truman has asked Congress to extend this title for another year. But the commission's authority to use funds for this operation will run out February 28. Resolutions to continue this authorization are pending before congressional committees, but no action has been taken as yet.

Operation of the tanker fleet does not cost the Government money. On the contrary, it is a highly profitable operation. But if the Maritime Commission does not obtain renewal of its authority to maintain a revolving fund, all receipts from tanker charters will go directly into the U. S. Treasury, leaving the commission with no funds for operating expenses. The commission is also operating a fleet of dry-cargo vessels, many of them at a loss, and profits from tankers have been keeping the revolving fund going.

May Not Be Chartered

Because of a peculiar provision in the Ship Sales Act, government-owned tankers may not be chartered on a bare-boat basis, though dry-cargo ships may. This means that if the 240 tankers are laid up, they will stay in the reserve fleet until sold. This may accelerate the sale of tankers, but it takes weeks or months to negotiate a ship sale and get delivery.

Moreover, there is little prospect that private companies would purchase the entire fleet of 240 tankers, or even a substantial portion of it, at this time. While the world demand for tankers exceeds the number now operating, there is no assurance that this demand will remain at its present level. Many of these tankers are being used for military and emergency relief needs, and these requirements may decline soon. In view of this most operators hesitate to spend the approximately $2,000,000 required to purchase a tanker with the prospect that it may not be kept busy a few years from now. The Maritime Commission has sold 114 tankers of various types since passage of the Ship Sales Act, and more purchase applications are pending. Prior to passage of this act private operators purchased some 70 tankers under other legislation and took back between 300 and 400 of their own tankers which were chartered to the Government during the war.

Operated by General Agent

The 240 tankers are operated by general agents — none of them oil companies—which are paid a management fee. The commission secures the business and determines the routes and service of these vessels. They are chartered, for a single voyage only, to domestic and foreign oil companies, the U. S. Army or Navy, foreign governments, or others. Applicants submit schedules of their requirements — always more than the supply of tankers—and the commission makes monthly allocations of vessels. In actual practice the small oil company who needs, say, one tanker load every 2 months, is apt to get 100 per cent of its request, while large operators find their requests scaled down.

The charter rate was purposely set quite high, in fact so high many oil companies have complained. The commission did this not so much to make money for its revolving fund as to forestall any charges that the Government is subsidizing the oil industry by cheap freight rates. Since the world demand for tankers exceeds the number in operation, private owners use the same charter rates as those set by the commission. The voyage charter rate for Maritime Commission tankers is the same to everyone, including the Army, Navy, UNRRA, and foreign governments. Therefore these chartered tankers are not involved in the current controversy in Congress over whether or not the British are making adequate compensation for a group of dry-cargo vessels obtained from the United States during the war.

Apparently there is no practical way by which government-owned tankers may be chartered on a voyage basis except under the special provisions of the Second War Powers Act and the revolving fund. Dry-cargo vessels may be chartered on a bare-boat basis for long terms, and at a profit to the Government, but not tankers.

Reason for Distinction

One reason for this distinction in the law was the fear that large oil companies would bareboat tankers for "clean service" in which gasoline causes rapid deterioration of the cargo tanks, while reserving their own tankers for the "dirty service" which involves less rapid depreciation. Another reason was a fear that the commission's charter rate would give an unfair advantage to the charterer as against competitors owning tankers, and that this would retard the sale of surplus vessels. It was also felt that there was a world surplus of several hundred tankers, that demand for them would fall off rapidly, and that there would be no real need for the commission to charter tankers either on a voyage or bareboat basis.

Should the commission's operating authority terminate, abruptly it would mean that all 240 tankers would have to return for layup at the end of their current voyages. For example, a tanker now operating out of the Persian Gulf would have to return empty past Navy stations in the Pacific in need of petroleum products. Domestic supplies on the East Coast probably would run short rather rapidly, since between 90 and 100 of these tankers are currently engaged in supplying North Atlantic ports. Eight are in the West Coast domestic service, and the balance are in foreign trade.

Oklahoma Section Will Hear A.C.S. Speaker

Dr. K. M. Watson, University of Wisconsin professor and a touring speaker of the American Chemical Society, will address the Oklahoma section of the society at a meeting in the Mayo Hotel, Tulsa, February 21.

Watson will speak on "Kinetics of Reactions Catalyzed by Solids." His address will be preceded by a short talk by Gerald Westby, president of Seismograph Service Corp. Petitions have been initiated for the creation of three divisions in what is now the Oklahoma section, calling for separate groups in Tulsa, Bartlesville, and either Stillwater or Norman.

Crude Runs of 4,805,000 Bbl. Daily Needed in 1947, Peake Says

by A. W. Peake

A. W. Peake is president of Standard Oil Co. (Ind.). He started in the oil business in 1912, the year of his graduation from Stanford University. In 1916 he went with Midwest Refining Co., control of which was acquired by Standard of Indiana in 1921. He became president of the company in 1944. Published here is the text of his address, "The 1947 Outlook for the Petroleum Industry," given at the Conference on Distribution in 1947 conducted recently in Chicago by the Chicago Association of Commerce and Industry.

THE demand for petroleum products in 1947 should be approximately 4 per cent greater than that experienced in 1946. A 4 per cent improvement of sales may not sound like much of an increase to some who represent industries which faced substantially greater reconversion problems than did the oil industry. You must recall that there was a definite surge of buying of petroleum products starting immediately with the lifting of rationing in August 1945. The oil industry had an unusually good year in 1946, and it is my expectation that 1947 will show further improvement.

Perhaps for comparative purposes you would appreciate the level of operation contemplated for 1947 if I were to compare it with the last full prewar year of 1941. On this basis, the demand for petroleum products in 1947 will be 25.7 per cent higher than it was in 1941, or, it will be 143,000 bbl. per day higher than the combined civilian and military demand during the year 1945. The large decline of military requirements will be more than offset by growth of civilian requirements. The industry will have to achieve better than wartime levels of operation, even though much-needed construction has not as yet been accomplished because of lack of building materials.

Meeting Anticipated Demands

Members of the oil industry recognize petroleum as the essential ingredient of a highly industrialized society, such as exists in America. Meeting the huge anticipated demands is a must, for, if not met, the industrial and economic progress of the nation will be to that extent retarded. Perhaps the most important message I can bring is that, in my judgment, the oil industry will promptly meet the demands made upon it. To do so will necessitate an average level of crude runs of approximately 4,805,000 bbl. per day as compared with the level of accomplishments in 1945 of 4,711,000 bbl. per day. I am convinced that it can be done and that the industry will meet the full demand for its products in stride.

Competitive conditions in the industry will continue keen throughout 1947. The primary suppliers will compete increasingly for the acquisition of needed crude oil to meet requirements. The petroleum industry is today reaching farther and farther for its raw-material supplies and is undertaking a constantly expanding effort of exploration and development of new sources of supplies. These increased costs, plus additional processing, transportation, and distribution charges applicable to all branches of the industry, will necessitate a continued firm price for petroleum products. There may be, of course, sporadic local price disturbances introduced by tankage limitations on particular products. These will not be general, nor are they likely to characterize conditions in the industry when the year is over.

Profits in 1947

As for profit possibilities in 1947, it is too early in the year to offer much of an indication on this subject. 1946 was characterized by inventory appreciation, as long-delayed adjustment to increased costs was made following termination of OPA controls. Dollar value of sales in 1947, however, should appreciably exceed that of 1946. This is perhaps the only profit indicator anyone could give at the present time for 1947. There are so many uncertainties that I am loath to submit a more tangible estimate.

There will not be any burdensome accumulation of inventories in the oil industry in 1947. In our industry, we face a substantially different inventory problem than that faced in the durable-goods industries. Refined petroleum-product inventories are characterized by fast turnover and are generally readily adjustable to variations of demand. The principal problem in the oil industry is the accumulation of necessary stocks of finished products in the off-season period to meet the seasonal demand in the period of peak consumption. This brings me to a point of considerable significance. The total winter demand on the oil industry has grown to the extent that requirements for petroleum products during the winter period are greater on a barrels-per-day basis than is experienced during the peak of the summer period of consumption. This shift of demand has required substantial modification of inventory policies and has necessitated provision for adequate tankage.

My brief message would not be complete without referring to a very new development that is taking place in the oil industry. The demand for burning oils of a distillate character and for diesel fuel, which is also a light distillate, is expanding much more rapidly than is the demand for gasoline—currently our principal revenue product. With the variation in the rate of growth of demand for these products, many problems of refinery operations incident to change of the yields of the various derivative products from a barrel of crude oil, and problems relating to the adequacy of storage and distribution facilities for distillate fuels, are now upon us. In a very real sense, this is the second time that the oil industry has faced a major shift in the demand for, and economic dependence upon, its derivative products. The first was a shift from kerosene to a gasoline economy, and now we are witnessing a shift to an economy dependent jointly upon gasoline and distillate fuels.

The growing requirements for distillates are now competing for an ever-expanding portion of the barrel of crude oil processed at the refinery. Consumers of distillates are competing with the gasoline market for supplies, and we are exercising a selection of desired fuels, and choosing oil increasingly over coal. Distillates are no longer a byproduct of refining, in any sense of the word. They now take rank as one of the major derivatives and undoubtedly will assume a fast-growing economic significance in the future of the industry.

Rangely Wells Sold

Stanolind Oil & Gas Co. recently bought two leases and two producing wells in Rangely field, Colorado, from Algord Oil Co. for $1,080,000. Algord is owned by the Guiberson interests in Dallas. It was understood the two Weber sand wells will be deepened and that the agreement contains a clause whereby Stanolind will make a future payment if production is found.

International

WORLD-WIDE OIL DEVELOPMENTS

Venezuelan Oil Bureau Indicated By Minister of Fomento's Report

CARACAS. — Another indication that the Venezuelan Government is still thinking of some federal bureau with as yet undefined jurisdiction over petroleum matters was given here recently by Dr. Juan Pablo Perez Alfonzo, minister of fomento.

Perez Alfonzo, in his annual report on the Technical Office of Hydrocarbons said: "The unencumbered reserves that Venezuela still holds should be better known before they are made the object of any negotiations; they should render for the collectivity of maximum benefits resulting from their exploitation by a competent national enterprise, or through an open and public offer to interested parties." The minister added:

"What is more, never will petroleum exploitation be allowed to expand without first having the assurance that Venezuela's economic development will derive the greatest benefit from it."

In a later statement Perez Alfonzo declared Venezuela now has a "reasonable division" of profits and is planning no increase in royalties or taxes affecting its oil fields. A recent remark that a 50-50 split would be just and equitable had been interpreted in some quarters as a government plan to increase its share of oil profits.

"The 50 per cent participation is accepted as a just participation in net profits from oil exploitation, and I consider that this is approximately the government's present share since the recent revision of income tax rates," he said. The government and private companies, he said, are "in perfect accord" as to the equitability of the present division of profits.

Perez Alfonzo criticized Venezuela's previous administration for "quite blindly and impetuously granting concessions with extensions almost equal to the ones already being exploited by the petroleum companies."

In further criticism of the previous administration, he said:

"Prompted perhaps by the fiscal situation which they thought would grow continuously worse during 1944, the previous government did not have the presence of mind to adopt other measures and rushed into negotiations involving our petroleum reserves, without realizing what this might mean. And what is more important, without taking measures that would safeguard our national interests and assure obtaining the greatest profits the market would allow."

This could have been accomplished, the minister of fomento said, "by means of a publicity campaign and open bids, which was never done. On the contrary, they proceeded almost blindly, without any assurance of obtaining the greatest collective benefits. In the future, a democratic, responsible Venezuelan Government will never again grant concessions as has been done in the past."

Submerged Colombian Area to Be Explored

CIA. DE PETROLEO SHELL DE COLOMBIA has been granted a permit by Colombia's Ministry of Petroleum for exploratory work in territorial seawaters in the vicinity of Puerto Colombia which is almost due west of Barranquilla. This is the Shell concession bid filed about 4 years ago.

Currently, Sinu Oil Co. (jointly owned by Socony-Vacuum Oil Co. and International Petroleum Co. Ltd.) is drilling about 10 miles south of Puerto Colombia at Tubara with encouraging shows around the 6,000-ft. level. East of this area, Texas Petroleum Co. also has a concession bid filed on the Salamina Island and Continental Shelf.

Although eight concession contracts were signed last year in Colombia, only seven were granted. Identified, with the operators doing the drilling, they were: Tropical Oil Co.— El Paso, Chaviva, San Antonio, and Guachiria; Shell — Macarena; Socony-Vacuum— Aguas Claras; Texaco—Remolino.

A report from Bogota states that it is significant that oil-concession bid No. 479 was filed with the ministry December 31, 1946, whereas the latest bid accepted—meaning studied and the technical reports found in order—is No. 308. This indicates that 171 bids are pending and represents at least a year's work by the ministry.

In 1945, a total of 20 bids were accepted; in 1944, there were 58; and in 1943, only 21. Data for 1946 is not yet available, but indications are that not more than 15 bids were accepted.

New Drilling Program Reported by Russians

Drilling operations in Russia (presumably development and wildcatting) are to be stepped up 100 per cent this year, according to a Moscow radio report received by Reuters' London office.

The Soviet petroleum industry, in cooperation with research institutions, has developed a new domestic catalytic-cracking process, the Russian press reports. It is explained that as the result of experiments whereby high-octane gasoline was obtained from unfinished gasoline and paraffin distillate, a greater use of the catalytic-cracking process is foreseen.

Two large refineries reportedly went on stream last year in Russia, and oil production in the eastern territories was said to have improved by about 40 per cent.

Pemex Moves Office

The Houston office of Petroleos Mexicanos has been transferred to New York effective February 1. Carlos Alvarez Garcia, formerly in charge at Houston, is in charge of the New York office which is located at 74 Trinity Place, New York 6.

Argentina Gas Line To Follow Good Roads

THE 1,100-mile natural-gas pipe line from the Comodoro Rivadavia fields to Buenos Aires, which the Argentine Government proposes to build (The Oil and Gas Journal, February 8, page 44), will be laid alongside good highways. The highway adjacent to the northern section between Bahia Blanca and Buenos Aires is concrete all the way. The highways south of Bahia Blanca are hard surfaced.

According to the present plan, pipe

Juan B. Siri and Abel O. Malvestiti, members of the Argentine Government commission now in the United States seeking materials for the construction of the Buenos Aires natural-gas line. A photograph of T. M. Tabanera, head of the group, appeared with the Journal's article February 8, page 44

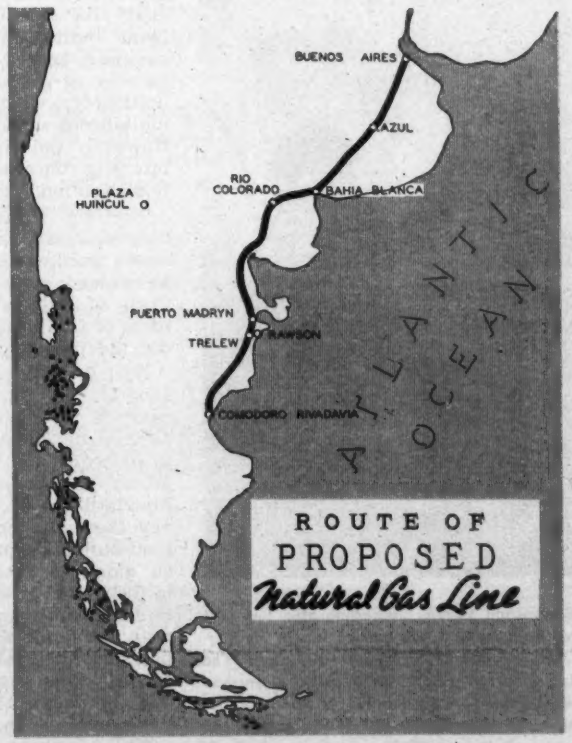
imported for the project is to be unloaded at four seaports from which construction would progress simultaneously; these ports are: Buenos Aires, Bahia Blanca, Puerto Madryn, and Comodoro Rivadavia.

The original plans called for construction of the line with 10-in. pipe but there is a possibility that the design may be modified for the utilization of larger-diameter pipe.

Gas will be distributed to communities along the route. The largest concentrations of population to be served are at Buenos Aires and in the area between Buenos Aires and Bahia Blanca.

Argentine States Gas Service Department (Direccion General del Gas del Estado, Secretaria de Industria y Commercio), is represented in the United States by a commission headed by T. M. Tabanera, who was graduated from the University of La Plata as a mechanical and electrical engineer and has subsequently been connected with the refinery department of Yacimientos Petroliferos Fiscales (Y.P.F.).

Juan B. Siri assists Tabanera in engineering matters. Siri graduated from the College of Physical and Natural Science, University of Buenos Aires, as an industrial engineer. The secretary of the commission is Abel O. Malvestiti, who left the Standard Oil Co. of Argentina to join the refinery department of Y.P.F.; later he became secretary of the gas department; he holds a similar position in the Argentine States Gas Service Department which has recently been established as an organization entirely separate from Y.P.F.



Route of the proposed 1,100-mile natural-gas pipe line planned by the Argentine Government

Fourth Spring Hill Test Gets Negative Results

CHILE'S fourth test in Spring Hill field, Tierra del Fuego archipelago, went to a depth of approximately 7,500 ft. with results described as negative. However, the electric log reportedly showed good indications. Some trouble was encountered with caving.

Drilled to a depth 60 ft. lower than the discovery well (The Oil and Gas Journal, March 23, 1946, page 64), Corporacion de Fomento de la Produccion plans to drill the fifth test to the southwest of No. 3. The third test at first yielded only gas but later showed a good potential of high-grade oil, Oscar Carjardo, minister of national economy, reported.

Chile's discovery well was brought in December 29, 1945, and is believed to have a daily potential of 8,000 bbl. of 39°-gravity (A.P.I.) crude. Due to lack of transportation, however, it has been shut in. The second well, abandoned early in 1946, was a dry hole. Competent authorities state that Chile's Spring Hill field will be a prolific producer with 1,000-bbl. daily as the average flow.

Two more rotary rigs, now en route to Chile, are expected to be in operation by late April. The rigs are owned by Fomento. George P. Livermore, Lubbock, Tex., is doing the drilling. Geological work has been conducted by United Engineering Corp. under the direction of Glen M. Ruby.

Plans for pipe-line and refinery construction are still under way with indications that a $10,000,000 refinery eventually will be located near Valparaiso.

International

Clothing Gathered For Overseas Oil Workers

A 10-day campaign is currently in process among domestic employes of Standard Oil Co. (N.J.) to collect warm clothing and shoes for nearly 30,000 persons, families of some 7,900 employes of overseas affiliates of the company.

Until recently there was no way to get clothing to the families, located in Hungary, Romania, and Austria, but arrangements for delivery now have been completed by the Franciscan Fathers. A year ago company employes sent 18 tons of clothing to company employes in France, Holland, Belgium, and the Scandinavian countries.

Nazi Oil Cartel Dissolved

Joint action of British and American occupation authorities has dissolved Arbeitsgemeinschaft Schmierstoff Verteilung, a cartel formed by the Nazis to monopolize the sale of petroleum products, according to reports from Berlin. Stocks of products held by the cartel were allocated to distributors to facilitate dissolution. Under the ruling, new organizations may enter the oil trade after licensing by German authorities.

Trans-Arabian Pipe Line Becomes No. 1 Middle East Project

by Warren W. Burns

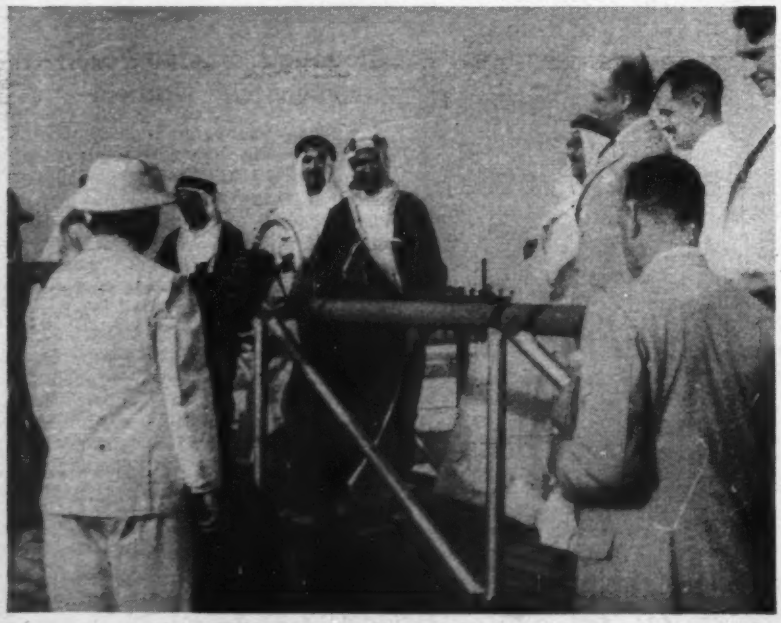
COMPLETION of the trans-Arabian pipe line some 3 years hence will bring Middle East oil to the backdoor of Europe, its best potential and most likely market.

Construction of this pipe line is now defnitely slated as the No. 1 postwar Middle East oil-transportation project. Laying and operation of the 1,050 to 1,100-mile line from the Persian Gulf area across Arabia to some as yet undisclosed Mediterranean port will call for the industry's best engineering and executive talent in view of the difficulties of terrain, climate, and supply.

The line, to be built by Trans-Arabian Pipe Line Co., will be jointly owned by The Texas Co. and Standard Oil Co. of California (the original owners) as well as Standard Oil Co. (N. J.) and Socony-Vacuum Oil Co., Inc., which are now closing negotiations for the extended partnership of Trans-Arabian as well as Arabian American Oil Co. Arabian American is jointly owned by Texaco and California Standard. The line probably will be 28 to 30 in.

Construction of another big inch Middle East crude-oil line, definitely catalogued as a "must," is the one in which Anglo-Iranian Oil Co., Ltd., with Jersey Standard and Socony-Vacuum, will be partners. This line will originate in Kuwait with a feeder line to Iran. The already announced crude-oil purchase agreement between the two American companies and Anglo-Iranian, extending over a 10 to 20-year period, will not become effective until construction of this second Middle East line is completed — possibly sometime in 1952. Completion of the No. 1 line is tentatively set for 1950. *(A map showing the area to be covered by the Trans-Arabian lines was published in The Oil and Gas Journal, December 21, page 61).*

At present, studies are being made on the economic aspect of using a joint right-of-way for the trans-Arabian and Kuwait to Mediterranean lines. The tremendous cost of building and maintaining desert pumping stations may be the factor which will swing the decision to a single right-of-way. The Kuwait concession is jointly owned by Anglo-Iranian and Gulf Exploration Co., subsidiary of Gulf Oil Corp.



Kuwait is expected to be the point of origin for the second Middle East crude pipe line now under discussion. The Kuwait line, with a feeder from Iran, would extend to the Mediterranean, possibly on a joint right-of-way with Trans-Arabian Pipe Line Co.'s line. The scene took place last year when the shaikh of Kuwait, Sir Ahmed Al-Jabir as-Sabah, turned a silver valve wheel in a ceremony marking the beginning of the loading of Kuwait's first overseas oil shipment. Kuwait is now producing more than 40,000 bbl. daily. Left of the shaikh is J. M. Dougary, storage and export department, Kuwait Oil Co.; right are C. A. P. Southwell, manager director of Kuwait Oil; D. A. Cambell, commercial superintendent; J. E. Patrick, field superintendent, and L. D. Scott (with back turned) general superintendent

Factors Retarding Plans

Lack of sufficient steel as well as mill rolling capacity appears to preclude the possibility of both lines being built simultaneously. Lack of shipping space and an insufficient number of pipe-line crews are other bottlenecks which seem to make simultaneous construction improbable. However, the American and British interests concerned are still studying this situation.

That the United States offers the only necessary big inch rolling mills seems pretty certain. The line will be welded, and either A. O. Smith Corp. of Milwaukee or Consolidated Steel of California, or both, will handle the pipe-rolling contract.

Burt E. Hull, president, Texas Pipe Line Co., left the United States February 5 for Arabia on a reconnaissance trip. In April a party of 30 to 40 headed by William C. Seal, engineer loaned to Trans-Arabian by Standard Oil Co. of Texas, will survey the route on the ground. Some road-building equipment will be taken along to break the trail. Later, in 1948, the pipe is expected to arrive in Arabia and at the Mediterranean terminus, with actual construction scheduled to be under way early in 1949. This means that the project may be 2 years in the preparatory stage and 1 year under construction.

While current reports state that there will be six pumping stations,

(Continued on page 66)

... the perfect answer to a problem at Wetumpka

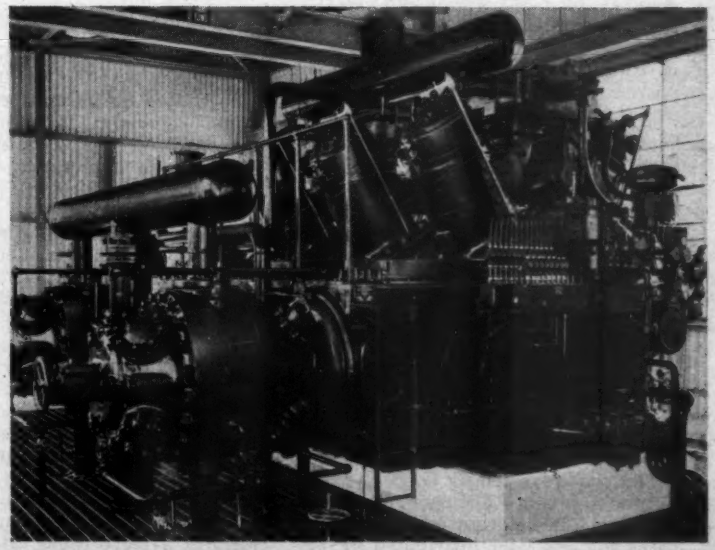
At Southern Natural Gas Company's Wetumpka, Alabama compressor station the gas supply drops during part of the day. It is desirable to maintain a constant discharge pressure when the supply is up; but not less than a specific suction pressure when the supply is low. Here again, GMV's are teamed with a patented Cooper-Bessemer method of automatic control for the ideal answer.

Automatic speed control is interposed between each step of 4-step, automatic-pneumatic compressor unloading.

THE ADVANTAGES ARE MANY

1. Positive, even control of either suction or discharge pressure at will, and without excessive speed range. Engine operation is remarkably stable.
2. At any capacity from 33⅓% to 100%, compressor capacity exactly matches load demand without continual loading and unloading of compressor steps.
3. All loading steps occur at maximum engine speed, where load increases are easily absorbed.
4. All unloading steps occur at minimum speed, where slight speed increase due to reduced load is not objectionable.
5. Compressor steps are not continually in operation, off and on, but remain in one position until load demand changes sufficiently to require additional steps.
6. Controlled pressure is exceptionally smooth and regular, free from the constant up-down variation common with previous step unloading systems.

Whether or not you need automatic control at its best, you'll always be ahead with Cooper-Bessemers. For Cooper-Bessemer V-angles — the modern GMV's and GMX's, 200 to 1000 hp — are first of all exceptionally reliable and efficient units for any kind of compressor service.



Each GMV drives two compressor cylinders, with provision for one step of unloading at one end of each cylinder, either automatically or manually controlled from control panel.

by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Houston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

International

(Continued from page 62)

175 miles apart, and that from 300,000 to 330,000 bbl. will be moved daily, indications are that this capacity is only the starter and that eventually this might be stepped up to 500,000 bbl. daily—a figure declared to be the economic maximum. It is no secret that the daily movement by both big inch lines of 1,000,000 bbl. of Middle East crude to the Mediterranean is a long-range project, which may well materialize in 15 to 20 years.

In transporting crude by pipe line, from the Persian Gulf to the Mediterranean, well-informed sources estimate that there is an approximate 10 cents per barrel saving compared with tanker movement. And while the method of financing would alter the figures one way or the other, a 40-cent per barrel cost by tanker and 30 cents per barrel cost by the projected pipe line (not allowing for any return on investment in either case) are considered good estimates. The tankers, in this case, would be foreign flag ships with the resultant lower operating costs. And of course the exact location of the Mediterranean terminus would also alter the figures slightly.

The question of expanding Arabian American's 110,000-bbl. daily stabilization plant will depend largely on amount of crude to be exported. The company's Ras Tanura refinery is running unstabilized crude. The possibility of constructing a stabilization plant at the Mediterranean end of the line, and running unstabilized crude from the fields, is a possibility.

Importance of Line

The importance of the trans-Arabian line to the world's oil economy was indicated in New York recently when it was made known that The Texas Co. was influenced to locate its new refinery in the Philadelphia-Camden area because of the possibility that substantial imports of oil into the United States may be used to meet the nation's expanding demand.

This was revealed by G. R. Bryant, Texaco's general manager of refining, in a talk before a private dinner gathering and later distributed to the press. The first unit of Texaco's major East Coast refinery will have a 40,000-bbl. daily capacity. (The Oil and Gas Journal, February 8, page 102, and May 18, page 90).

Exactly when Jersey Standard, Socony-Vacuum, and Arabian American will announce consummation of negotiations to expand the partnership of the latter remains uncertain, due partially to the legal action taken in London by Cie. Francaise des Petroles to halt the pending deal. (The Journal, February 1, page 29; January 18, page 44; and December 21, page 42). The legal implications which Arabian American, under the projected new partnerships, might possibly be subject to in international law, in view of the Cie. Francaise court action, are being duly considered. However, it is a good guess that the partnership negotiations will be signed some time this month.

Meanwhile, officials in both Jersey Standard and Socony-Vacuum are having occasion to reemphasize their stand that the Middle East oil operations will not harm domestic producers. It is pointed out that economists believe domestic and world demand for petroleum products is mounting so swiftly that all concerned will find adequate markets at satisfactory prices.

The following figures, exclusive of Russia, show total demand for crude and products through 1965: (U. S. figures include imports and natural gasoline).

(In millions of barrels daily).

Year—	World demand	U. S. demand
1946	7.3	4.9
1950	8.35	5.4
1955	9.2	5.8
1960	9.7	5.9
1965	10.2	6.0

As these figures indicate, if present production were not increased, there would be a shortage of about 3,000,000 bbl. of crude and products daily. This is about what the entire United States was producing before the war.

Because of the tremendous stake which Jersey Standard affiliates have in the United States and because the parent company is economically bound to protect those interests, the 1947 domestic exploratory programs of the Jersey Standard will be greater than ever before.

In answer to several direct questions of The Oil and Gas Journal concerning Jersey Standard's economic policy on foreign operations, particularly in the Middle East, reference was made to an address given November 9, 1945, by John R. Suman, vice president and director of Jersey Standard, before the Texas Mid-Continent Oil and Gas Association, and told that those statements are as good today as they were in late 1945.

"Consumption of petroleum abroad was, before the war," Suman said, "rising at a more rapid rate than in our own country. Most observers expect the trend to be resumed in the future. This is particularly true in the Western Hemisphere where rapid strides to higher living standards by our Latin American neighbors are anticipated.

"And of special interest . . . is a fact suggested by studies of over-all Western Hemisphere oil supply and demand trends. It is that over the next 20 years or so great activity in exploration and development in the hemisphere outside the United States will be necessary to meet foreign needs alone."

In making these statements, Suman possibly had in mind Jersey Standard's Venezuelan subsidiary, Creole Petroleum Corp.—the world's largest single crude-oil producer — and the fact that large crude exports from Latin America have provided (and still provide) a large European demand. Eventually it is hoped that the Eastern Hemisphere will be self-dependent, in so far as crude oil and products—except for specialties—are concerned.

On the question of a strong U. S. oil industry, Suman is still of the belief that imports should be used only as a necessary supplementary source and that petroleum imports should not flood the market to the injury of the domestic trade.

"Excessive imports could adversely affect the search for oil at home," the Jersey executive said, "and for reasons of national defense alone they must be avoided. Our domestic industry must remain strong and virile, for a healthy domestic industry is our best possible insurance against future and sudden military demands for oil."

However, Suman pointed out that "in Jersey's view, importation of oil under the guidance of sound policy has a logical economic place as a supplement to our domestic industry in achieving the goals of conservation and well-rounded supply. In such a place, imports aid the flow of world trade and the economic well-being of our own and other nations."

French Refinery Output Averages 37,000 Bbl. Daily

Daily average production of French refineries, for the first half of January was 37,000 bbl., compared with 98,000 bbl. for a like period in 1938, according to a recent Reuters dispatch from Paris.

Crude-oil production in France during December 1946 totaled 4,170 metric tons (31,692 bbl.), or approximately 1,000 bbl. daily, compared with 4,036 metric tons (30,674 bbl.) for November. December natural-gas production amounted to 10,361,000 cu. m. (372,635,000 cu. ft.) ,compared with 10,328,000 cu. m. (361,480,000 cu. ft.) during the previous month.

The output of French oil refineries during the last month of 1946 follows (Figures in tons; 1 ton is approximately 7 bbl.):

	Dec. 1946	Monthly average 1938
Gasoline	60,844	194,000
Kerosene	11,378	14,000
Gas oil	34,073	36,500
Fuel oil	77,630	180,000

WASHINGTON WATCHING

BY HENRY D. RALPH

Krug's Proposals

WASHINGTON.—Secretary Krug's first annual report as head of the Interior Department contains little to cause apprehension on the part of the petroleum industry beyond his expressions of concern for the rapid rate at which the nation is using up its reserves of oil as well as of many other minerals.

It is not an alarmist document, and there can be little quarrel with his assertion that such matters are of vital concern to all our citizens "for we all live on our natural resource base." However, his proposed remedies lean rather heavily in the direction of action by the federal Government. He expresses guarded optimism that much more oil remains to be discovered in the United States, and even greater hope that what we already have can be used more efficiently by research into production methods, secondary recovery, and better use.

He would like to start out with an inventory of all our mineral resources. By this he means not just adding up our known reserves, but sending out government scientists to map and explore every foot of land with seismographs, core drills, and every known technique. To do this right, Krug says, would take 20 years and a billion dollars, but he thinks a start should be made and that it would underwrite the future of the petroleum, iron ore, and many other industries.

Krug's oil program includes federal assistance in exploration, including the Continental Shelf, research in secondary-recovery methods, development of synthetic-fuel processes to the point where they will be economical, assisting (methods not specified) in utilizing gas wasted in oil production, and improving refinery techniques to get more heat and power out of a barrel of crude.

Tariffs Based on MER

A HINT that an oil-tariff formula might be based on the maximum efficient rate of production of domestic fields is contained in the Interior Department's annual report.

"The equivalent of replenishment of our own reserves may be secured in part by importations of oil," it says. "From the conservation viewpoint the extent to which we can produce oil without causing physical waste is a prime factor in measuring our needs for oil from outside sources.

"Foreign supplies must be geared to the situation of the domestic oil industry as well as to the needs of the rest of the nation's industries and homes. The need for such foreign supplies is obviously of a different order of magnitude today when we are using substantially all of our efficient productive capacity from what it was in the prewar days when we had a reserve capacity of a million barrels daily that we could bring into production at any time. In this connection it is necessary for us to have reliable, disinterested yearly estimates of our efficient productive capacity."

Competition between the oil and coal industries is minimized by the department in its report.

"The oil industry," it says, "does not expect to be competitive with the coal industry except in the fields of transportation and in residential and office heating, in which it also encounters the competition of the gas industry. Its preferable output is gasoline, diesel oil, and lubricants, rather than residual fuel oil.

"The mineral agencies of the department are aware that competition between oil and coal can be expected in the near future. However, they believe that since it would be uneconomic for the petroleum industry to produce fuel oils as such, but only as byproducts of gasoline and then only at a minimum rate, the relative amount of such competition may decrease, and may be of less importance in the industrial fields in the future."

Middle East Investigation?

HEARINGS on the Anglo-American petroleum treaty, tentatively scheduled by the Senate foreign relations committee for early March, could develop into a rather general investigation of the foreign activities of American oil companies and current developments in the Middle East.

Unconfirmed rumors are floating around Washington that somebody is getting ready to blow some kind of a lid off in connection with Arabian oil. Rumors of an impending investiation are always a dime a dozen in the capital, and this may be just another one of those things, but there are a few straws which can be plucked out of the wind for purposes of building a straw man, such as:

The two protests filed with the State Department by the French ambassador against the proposal of Standard of New Jersey and Socony-Vacuum to buy into Arabian American Oil Co. These have not been formally answered as yet, but the implication is that the U. S. Government is officially involved in the deal somehow.

The suit filed by James A. Moffett, one time vice president of Standard of California, against Arabian American alleging failure to pay for services rendered in getting Aramco out of some tight spots. The implication here is that Moffett used his influence as a government official to pull chestnuts out of the fire and that some British lend-lease money found its way into the royal coffers of Arabia to bolster an American oil concession.

The recent radio speech of Sen. Joseph C. O'Mahoney pointing out that the four U. S. companies interested in Arabia are powerful enough to dominate the world's oil trade. This could be merely a plug for the senator's bill to register corporations doing business abroad, but the left-wing press lapped it up and one of them headlined: "Old Standard Oil Octopus Reunites to Control World."

The opposition of domestic producers to treaties, foreign concessions, private deals, or anything else which contains a threat of larger imports of petroleum into the United States.

Veiled hints of skullduggery appearing in the syndicated newspaper column of Harold L. Ickes. While the Old Curmudgeon is now on the outside looking in, he has an elephantine memory and took with him a truckload of documents when he pulled out of the Cabinet. He favored the treaty when he was in charge of its drafting and when it appeared he would control its operation, but he is so prone to be critical of anything outside his own orbit that there is no telling what he may do now.

NPC Membership

C L. HENDERSON, president of Vickers Petroleum Co., Wichita, Kans., has been named to membership on the National Petroleum Council by Secretary of the Interior Krug.

Two original members of the council resigned recently, Robert H. Colley, president of Atlantic Refining Co., and E. B. Reeser of Barnsdall Oil Co. Henderson does not specifically replace either of these, but was appointed to keep the membership representative of industry. Before the next NPC quarterly meeting Secretary Krug expects to appoint one or

two representatives of independent retailers. Several nominations have been received from the industry.

The next meeting of the council probably will be April 22. The date had been set for April 15, but some members pointed out that this would conflict with the Cleveland meeting of the National Petroleum Association April 17 and 18, so a week's postponement is being discussed.

The appointments committee has not yet selected membership of the several new committees authorized by the council at its last meeting, though announcement is expected shortly. It may be some time, however, before Chairman Hallanan and the appointments committee select a paid secretary-treasurer to take charge of the NPC's newly acquired Washington office. Apparently the only council member pressing for quick action on this matter is Russell B. Brown of the I.P.A.A., who would like to be relieved as acting secretary-treasurer.

Freight Car Shortage

THE freight car shortage is going to pinch all industry severely for many more months, it appears as a result of congressional hearings which are being held on complaints of farm interests that an insufficient number of box cars is being allocated for shipment of grain.

In reply to these complaints spokesmen for many industries insisted too many cars are now in grain service with the result that manufactured goods are piling up in producers' warehouses and factories are closing down because they cannot get shipment of needed raw materials. The petroleum industry is already subject to severe loading requirements to insure maximum efficient use of box cars, and there is no immediate prospect that these restrictions will be relaxed.

Government officials called before the committee to explain, could offer little hope of relief for many months. It seems that practically no freight cars were built during the war and they are now going out of service at the rate of 4,500 per month, due to wrecks and obsolescence, while new ones are being built at the rate of only 3,500 monthly. Recently the Civilian Production Administration, which loses all its priorities powers next month, persuaded steel producers to promise a voluntary allocation of enough steel to make 7,000 railroad cars of various types every month, beginning in April. Now automobile, farm equipment, and many other industries are complaining that this will deprive them of steel just when they anticipated an uncontrolled market in this basic commodity.

The Office of War Mobilization and Reconversion reported that on January 15 car builders had on hand unfilled orders for 75,000 domestic freight cars, including 4,660 tank cars, both standard and high-pressure types. Last fall this office allocated steel for production of 530 tank cars before the end of 1946, and 665 more by March 31, most of them pressure cars for liquefied petroleum gas. However, this schedule is not being met. Officials estimate it will take 3 or 4 months before freight-car production reaches the 7,000 mark, and a long time after that before the number of cars in service reaches the prewar level.

Leasing Rules Modified By Interior Department

WASHINGTON. — Several changes in oil and gas leasing regulations have been made by the Interior Department recently, and study is still being given to criticisms from the industry regarding many provisions of the general leasing regulations promulgated by the Bureau of Land Management under the Act of August 8, 1946.

One important new regulation gives field supervisors of the Geological Survey authority to approve on-the-spot sales agreements or contracts for disposal of products from oil and gas leases on public lands. This covers not only the Government's royalty oil in most cases but also sale of the operator's oil and gas. The new regulation authorizes field supervisors to give final approval to sales contracts of 1 year or less, and conditional approval to contracts of more than 1 year, subject to final approval of the director of the survey.

Another new regulation of the Geological Survey covers the procedure to be used by holders of federal oil and gas leases in obtaining approval for unit of cooperative development plans. The final regulation is said to provide operators wide latitude in drafting unit agreements.

Still another new regulation centers in the Bureau of Land Management the authority to grant mineral leases, where such are authorized by law, on any lands acquired and administered by any bureau or agency of the Interior Department. The administering bureau continues to have jurisdiction over surface uses, but BLM will handle oil and gas leases subject to the surface use. Indian lands are not covered by this regulation.

Warren to Refuse Russia Shipments of Equipment

WASHINGTON.—Comptroller General Lindsay Warren last week testified before the Senate appropriations committee he will not approve a financial deal for shipping more than $25 million in supplies to Russia unless authorized specifically by Congress.

The goods involved include $12,483,345 in oil refining equipment and $12,345,000 in machine tools, production control devices and other supplies earmarked for Russia before the expiration of lend-lease.

Testimony before the committee showed Russia has put up cash for the equipment as requested but has ignored all American requests to set a date for talks on the methods of settling for the previous $11,260,000,000 worth of goods that went to Russia during the war.

Gas Shortage Slows Eastern Production

Thousands of industrial plants have been closed down in Ohio, Pennsylvania, New York and other eastern states as a severe cold wave drew heavily on natural-gas lines and brought emergency curtailment and shutdown orders from gas-distribution firms.

Thousands of workers in manufacturing plants throughout the area were out of work as gas supplies, insufficient in most parts to heat homes, dwindled. Laundries, bakeries and even restaurants in some areas were forced to close during the emergency.

Coinciding with the gas shortage was a recommendation from the industry-advisory committee of the Federal Power Commission that the Big Inch and Little Big Inch pipe lines be continued in gas service and their capacity increased. The committee report termed the recommendation the "only possible solution of the gas supply situation in the Appalachian area."

Geologist to Speak

John Hurndall, petroleum geologist and a former commander in the Navy, will speak at a meeting of the conservation committee of the California Oil Producers' San Joaquin Valley District Committees in Bakersfield, Calif., February 18. He will discuss his experience and impressions during a recent trip to Manchuria and Korea.

Colorado Strike Reported

An estimated 250-bbl. a day discovery from a depth of only 470 ft. was reported early this week in Archuleta County, Colorado, between Pagosa Springs, Colo., and Chama, N. M.

The well, Florence and Teague 1 C. C. Fitzhugh, is located in 4-33n-2w, about 4 miles north of the New Mexico-Colorado line. Eighteen hours of pumping was reported to have yielded 210 bbl. of 32° plus-gravity crude from a sandy streak in Mancos shale.

Public Relations Groups Organize In Southwest and Midwest

ORGANIZATION of oil-industry representatives in the Middle West and Southwest areas was set up last week to carry out the decentralized public-relations program of the American Petroleum Institute.

In Dallas, Fred F. Murray, president of Oil Well Supply Co., was elected chairman of District 3 by the district organizing committee which also divided the eight-state territory into three areas and chose chairmen and vice chairmen for each.

The District 2 organizing group met February 4—2 days earlier—in Chicago and decided to set up four district committees instead of one to administer the program in the Middle West.

An A.P.I. announcement said meetings of the temporary organizing committees in the other three districts—Eastern, Rocky Mountain, and Pacific Coast—will be held in the near future.

The public-relations program is to be outlined at meetings of various industry associations during the coming months. One of the first associations to endorse the program was the Independent Oilmen's Association of New England before which George Freyermuth, a member of the operating committee, and Keeton Arnett, of the Fred Eldean public-relations organization, appeared recently in Boston.

The District 3 organizing committee authorized Murray to name an executive committee to assist him and voted to follow the general plan of organization outlined by the A.P.I. public-relations committee. District-wide steering, finance, industry participation, and speakers committees will be organized from similar subcommittees in each of the three areas. The following officers were elected:

Area 1: Texas and New Mexico. J. Ed Warren, Midland, chairman, Hiram M. Dow, Roswell, N. M., Warren L. Baker, Houston, and John P. Morgan, Dallas, vice chairmen.

Area 2: Oklahoma and Kansas. C. O. Willson, Tulsa, and Lloyd Pickrell and Curtis Henderson, Wichita, vice chairmen. Chairman of this group is expected to be designated later.

Area 3: Louisiana, Arkansas, Mississippi and Alabama. W. M. Vaughey, Jackson, chairman; N. H. Wheless, Shreveport, T. M. Martin, El Dorado, and James E. Duffy, Grove Hill, Ala., vice chairmen.

The District 2 group in Chicago recommended that Oklahoma and Kansas, placed in District 3 for organization purposes, be returned to District 2 as provided in the old Petroleum Administration for War organization.

The four districts established, together with their temporary organizing chairmen, are: Tennessee, Ohio, and Kentucky—Eric V. Weber, Cincinnati; North Dakota, South Dakota, and Minnesota—Norman B. Curtice, Minneapolis; Nebraska, Iowa and Missouri—E. Dale Smart, Omaha; Michigan, Indiana, Illinois, and Wisconsin—L. S. Wescoat, Chicago.

No Action Taken on Lucky Field Allowable

BATON ROUGE, La.—The Louisiana Conservation Commission early this week took under advisement the evidence presented at a hearing on a new allowable for Lucky field and promised to issue an order after further study.

The hearing had been called in an effort to halt the export of 50,000,000 cu. ft. daily of Lucky field gas by the H. L. Hunt interests to the Tennessee Gas & Transmission Co. for transmission to the East via the Little Big Inch line.

The hearing had evoked widespread interest throughout Louisiana following the recent state District Court decision denying the conservation commissioner an injunction to prohibit production in the field. Several companies now drilling in the area have indicated they will cease operations if the Hunt interests are forced to cap their wells, declaring they cannot afford to develop a field where no market exists for its production.

Sun Buys Canadian Tract; Refinery Plans Reported

SARNIA, Ont.—Sun Oil Co. of Canada, Ltd., Canadian subsidiary of the Sun Oil Co., Philadelphia, has purchased a tract of land on the St. Clair River near Sarnia for the purpose of future development, according to a statement by J. Howard Pew, president of the parent company.

It is currently reported in Sarnia that construction of a $20,000,000 refinery will be commenced about March 15, with M. W. Kellogg Co. handling the contract and that the new refinery when completed will furnish byproducts to Dow Chemical Co.

Top Speakers Slated for Annual I.O.G.A. Meeting

MOUNT VERNON, Ill.—Hiram Dow, chairman of the Interstate Oil Compact Commission; Joseph C. O'Mahoney, U. S. senator from Wyoming; and Charles Rayner, petroleum adviser to the secretary of state, top the list of speakers scheduled for the annual meeting of the Illinois Oil and Gas Association.

The meeting will be held in Mount Vernon March 13. Dow will speak at an afternoon business meeting. O'Mahoney and Rayner will address the association following the banquet that evening. Hugh Cross, Illinois lieutenant governor, also will speak at the banquet.

Instrument Firm Drops Escalator Sales Clause

ROCHESTER, N. Y.—The escalator clause, through which goods are sold on a basis of "price at time of shipment" rather than on a fixed-price basis, has been dropped from the sales policy of Taylor Instrument Companies, manufacturers of household, medical, meteorological, and industrial instruments.

Declaring "stabilization of prices" is an "essential step in the restablishment of a firm national economy," R. E. Olson, vice president and general sales manager, said the action was taken in spite of the fact that much of the material bought by the companies still is purchased on an escalator-clause basis.

Cost Index Ups Sinclair Wages 7 Cents an Hour

Officials of the Oil Workers International Union have announced employes of the Sinclair companies would receive a 7-cent an hour increase under the union-company agreement of last November by which wage adjustments were tied to a U. S. Bureau of Labor Statistics living-cost index.

The new increase results from the announcement of the U. S. bureau that the consumers price index climbed to 153.3 as of December 15. The index January 15, 1946, was 129.9. Wages of Sinclair employes were adjusted upward 18 cents when the agreement was signed, thus giving 25 cents additional with the new increase.

O. A. Knight, union president, said the new level of 25 cents an hour figures $43.33 a month. This will be subject to revision in April when another index figure is announced for March 15. However, no other major company has signed a similar contract.

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Crude Changes, Fuel-Oil Advance Feature Market Developments

CRUDE-OIL price adjustments in several fields in the Southwest, a general advance in heavy fuel quotations in the New York area, and an increasingly acute tank-car shortage in the Midwest were developments of principal interest in the marketing field this week.

While No. 2 and kerosene prices continued weak on the East Coast despite colder weather, nearly all major suppliers followed the lead of Socony-Vacuum Oil Co., Inc., in increasing residual fuel oil prices 10 cents. Among companies posting higher prices was Standard Oil Co. of New Jersey with new tank-car prices of $2.37 per barrel for "cold" No. 5; $2.19 for "hot" No. 5, and $2.02 for No. 6.

Heavy stocks were holding back a firmer market for the distillate burning-oils in New York, but gasoline prices were steady with premium-grade motor fuel somewhat tight due to the continuing shortage of tetraethyl lead.

A cold wave throughout the Middle West stepped up the already heavy demand for burning oils from suppliers in this section. Sales officials said transportation delays and tieups caused by the weather had seriously interfered with rail movement of products.

Burning oils in the Mid-Continent and Middle West were moving in many cases ⅛ cent above the posted market tank-car low, with No. 2 bringing 5 cents and No. 1 5¼ cents. Middle West gasoline demand continued heavy for the season with many suppliers seeking stocks for the summer.

The crude market, where an advance has been expected for weeks, held major attention. Many market observers were anticipating a 25-cent increase with a corresponding ½-cent rise in the gasoline tank-car price.

The action of a group of nine producer and royalty owner associations last week in Fort Worth in asking a crude price averaging $2 a barrel heightened speculation over the likelihood of an advance. The associations representing most Southwest independent producers met at the call of J. P. Coleman, president of the North Texas Oil and Gas Association. The petition passed by the associations was submitted to 15 major oil companies buying crude oil.

Adjustments announced by several companies had the effect of raising the crude postings for several Lea County, New Mexico, pools by 6 cents per barrel. With facilities now available for segregating high-gravity sweet crude, The Texas Co. posted a new price of $1.12 for below 20° gravity with a 2-cent differential to $1.63 for 40°-gravity and above, for crude from the Brunson Ellenburger and Drinkard Clear Fork sectors of Lea County and the Freund pool of Andrews County, Texas. The advance was retroactive to January 9.

For Block 31 pool of Crane County, Texas, The Texas Co.'s new price is $1.28 for below 20°-gravity with a 2-cent differential to $1.70 for 40°-gravity and above. Sinclair Prairie Oil Co. posted the same price as The Texas Co. for Brunson and Drinkard, adding Blinebly pool in Lea County.

Magnolia Petroleum Co. announced similar initial postings for Brunson and Drinkard fields, though its gravity scale began at $1.31 for below 25° gravity. Magnolia also announced initial posting effective February 1 for crude from Mamou field, Evangeline Parish, Louisiana, ranging from $1.38 for below 20° gravity with a 2-cent differential to $1.80 for 40° gravity and above.

DEATHS

Charles F. Scholl, 62, Michigan oil producer and formerly production superintendent for Turner Petroleum Co., died recently in Mount Pleasant, Mich.

W. D. Thomas, 47, associated with Stanolind Oil & Gas Co.'s Henderson, Tex., producing department, died January 27. He had been with Stanolind for the past 17 years.

William T. Grigsby, 57, died February 3 near Waynesboro, Miss. He was associated with Gulf Refining Co. at Laurel, Miss.

Arthur A. Pierce, 59, Shreveport, La., construction foreman for Arkansas Fuel Oil Co., died February 4 in Mobile, Ala.

Edward E. Moran, 76, retired independent operator, died January 31 at his home in Crafton, Pa.

John W. Simpson, 78, drilling contractor, died February 5 at his home in Tulsa. He was associated with D. A. Bartlett in the opening of the old Sperry oil pool in 1911 shortly after coming to Oklahoma from Marietta, Ohio.

Ashley Carter, retired London manager of Oil Well Supply Co., died recently at his home in London.

Merrell M. Stuckey, 60, general Near East manager of Iraq Petroleum Co., Ltd., Haifa, Palestine, died in Haifa January 29. Stuckey, a pipeline engineer and one of the best-known oil-company officials in the Middle East, was graduated from the University of Missouri in 1909 and worked for Standard Oil Co. of New Jersey in Louisiana and for Humble Pipe Line Co. He later became manager of Andian National Corp., Ltd., in Colombia, and in 1930, joined Iraq Petroleum, serving since that time in the Middle East. He held decorations from the French, Iraq, Lebanon and Trans-Jordan governments for his work in supplying oil to Allied forces during the war.

George A. Forsyth, 50, sales manager of Forsyth Engineering Co., died February 3 in Houston.

Peter J. Rapp, 65, Bradford field producer, died February 4 at his home in Custer City, Pa.

Lewis Victor Lund, 64, independent oil operator, died February 6 in San Angelo, Tex.

R. M. Waggoner, 79, pioneer Wichita County, Texas, oil man, died in Wichita Falls February 5. Waggoner started in the oil business when he organized the Burk-Waggoner Oil Co. in 1918, and later brought in the first well in the Northwest field of Wichita County.

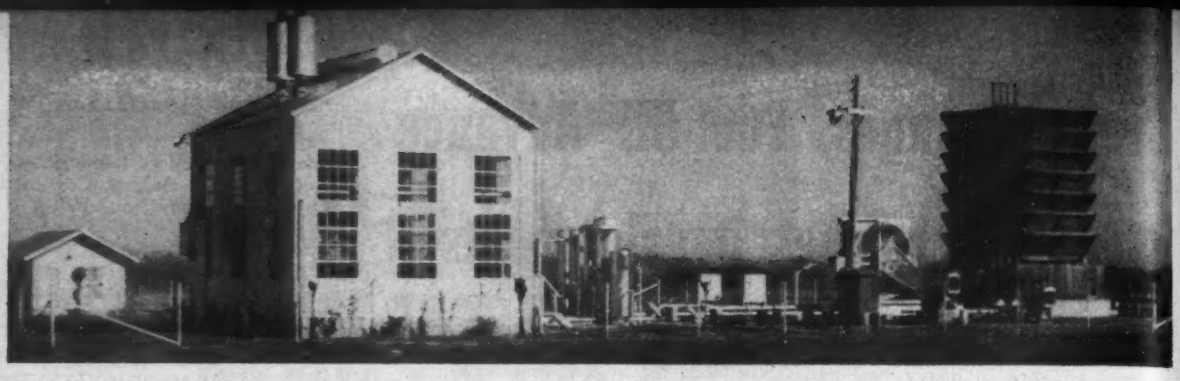
John H. Clopton, 47, geologist and independent oil operator in the Rio Grande Valley, died in a McAllen, Tex., hospital February 6.

G. M. Davis, field superintendent of Canadian River Gas Co., died February 8 en route from his home in Fritch, Tex., to an Amarillo hospital following a heart attack.

C. C. Bruce, 44, Magnolia Pipe Line Co. superintendent at Electra, Tex., until his retirement about a year ago, died February 6 at his home in Longview, Tex.

W. Basil McEvoy, 53, executive vice president and secretary of C. L. McMahon, Inc., died February 8 at his home in Tulsa. He had been associated with the McMahon firm 22 years, living in Okmulgee, Okla., before moving to Tulsa 19 years ago. Born in Bradford, Pa., he had been in the oil business most of his life.

Walter Elliot, general drilling superintendent for Shell Oil Co., Inc., died February 7 in a Los Angeles hospital.



Southern Minerals Corp. pressure-maintenance plant, Richard King field, Nueces County, Texas Gulf Coast. Left to right: Plant office building, compressor house, gas-scrubber installation (first column for compressed air for engine starting), inlet-gas meter runs, radiator cooler for engine jacket water, water-cooling tower for interstage gas-cooling coils and engine lube-oil cooling coil

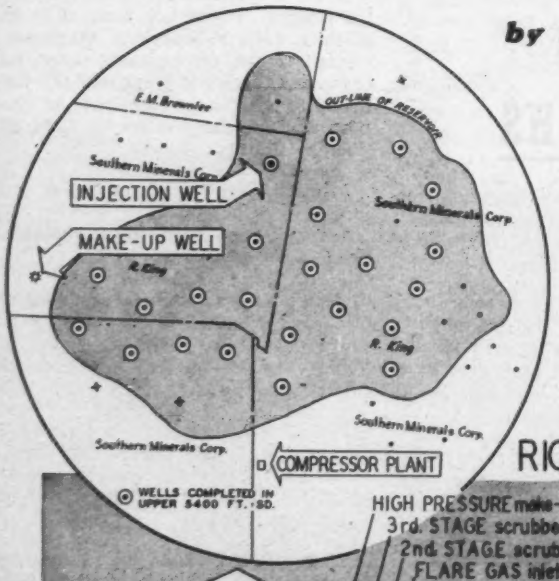
PRESSURE MAINTENANCE AT RICHARD KING DESIGNED TO HANDLE APPROXIMATELY

3,000,000 Cu.Ft. of Gas Daily

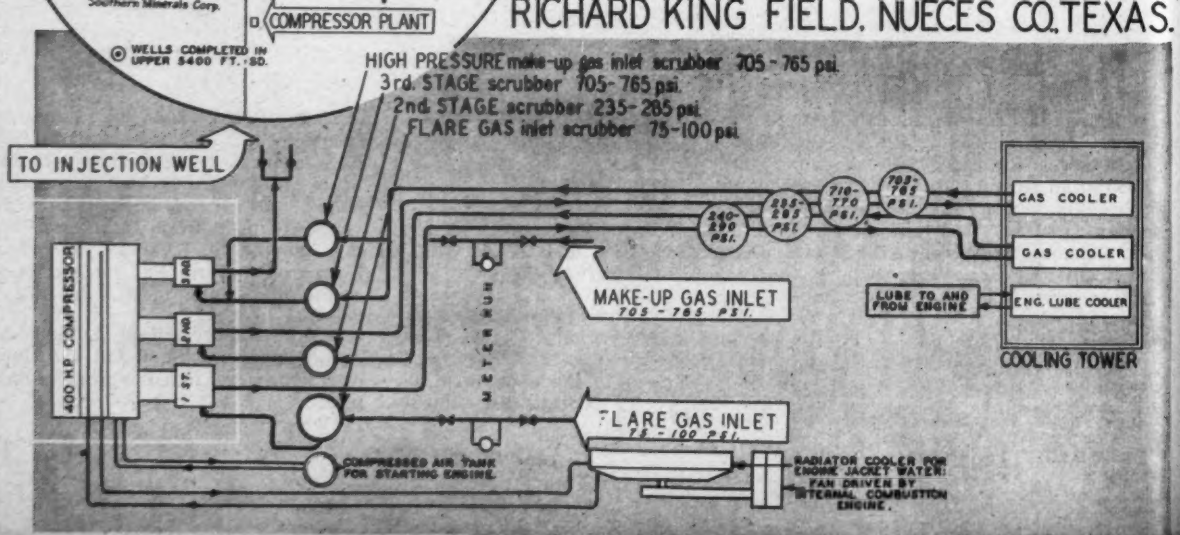
by Neil Williams

THE Richard King field, located 35 miles west of Corpus Christi, in Nueces County, South Texas, is one of the most recent areas in which pressure-maintenance operations have been undertaken. The project, initiated by Southern Minerals Corp., involves what is designated as the Upper 5,400-ft. sand, one of the multiple reservoirs producing in the field. Plant operation is designed to handle approximately 3,000,000 cu. ft. of gas daily, which includes all produced gas from this sand totaling about 1,666,000 cu. ft. daily, plus sufficient extraneous makeup gas, now about 1,000,000 cu. ft., to occupy reservoir space equivalent to that voided by current oil withdrawals. Gas injection was started August 23, 1946.

Of the various reservoirs in the field, the Upper 5,400-ft. sand is the only one in which it was considered advantageous or feasible to return gas to the formation for maintaining pressures. Most of the other sands have active water drives by which, with controlled production, maintenance of pressures and maximum oil recoveries can be expected without the aid of gas injection. Several are



Left: Portion of Richard King field, showing productive outline of Upper 5,400-ft. oil reservoir and wells completed in this sand. Locations of compressor plant, injection well and makeup gas well are indicated. Below: Operational diagram of Southern Minerals Corp.'s pressure-maintenance plant in the Richard King field

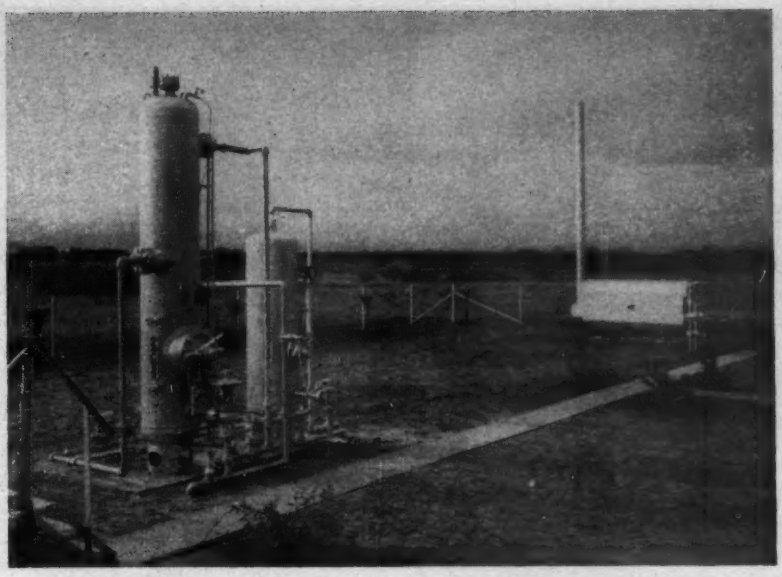


thin lenses of relatively small areal extent in which the remaining volume of oil in place is so small that any increase in recovery that might be derived by artificial pressuring of the formations might not justify the costs involved.

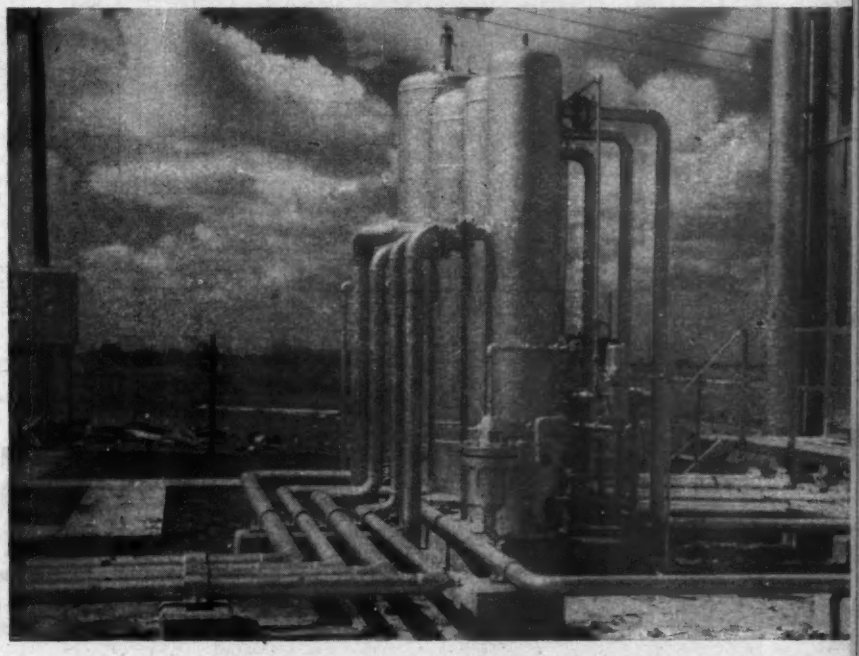
Productive area of the Upper 5,400-ft. sand embraces approximately 600 acres. With an average sand thickness of 9 ft., it contains 5,069 acre-ft. of oil and about 300 acre-ft. of gas sand. Unlike most of the other sands, it apparently has only a dissolved gas drive. This has been indicated by a rapid decline in bottom-hole pressure and increasing gas-oil ratios. Also, the water level, originally established at minus 5,282 ft. (elevation 130 ft.) has shown no appreciable advance, and water production has continued negligible. The gas cap, originally confined to an area one-tenth the size of the oil zone, has been steadily expanding with the gas-oil contact now at minus 5,200 ft.

Original reservoir pressure was estimated at 2,350 psi. At the start of gas injection, pressure had declined to 1,720 psi. The drop of 630 psi. averaged about 9 psi. monthly. Up to August 1, when gas injection was started, the sand had produced about 872,000 bbl. of oil with an average drop in bottom-hole pressure of around 1 psi. per 1,382 bbl. Daily production from the sand prior to the

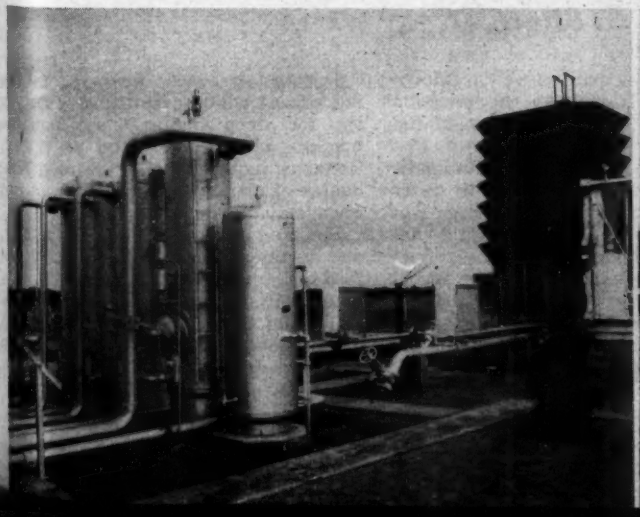
(Continued on page 90)

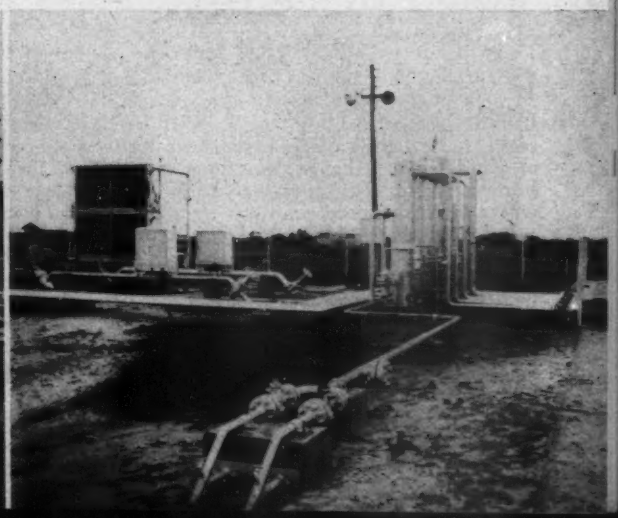


Separator and heater installation for pressure-reduction control at high-pressure makeup gas well. Makeup gas to plant is taken off high-pressure separator (left)



Right: Gas-scrubber installation. Scrubbers, front to rear, are for: Makeup gas inlet to third-stage compressor suction; flare gas to third-stage compressor suction; flare gas to second-stage compressor suction, and flare-gas inlet to first-stage compressor suction Below, left: Gas-scrubber installation (opposite side from view at right) showing meter runs for field flare gas and high-pressure makeup-gas inlets, and cooling tower (right). Portion of radiator cooler for engine jacket water partly visible at extreme right. Vessel at front of gas scrubbers is compressed-air tank. Below, right: Discharge gas (2,000 psi.) header to injection well. Three-inch header splits to two 2-in. underground return lines, which converge at well to single 3-in. line





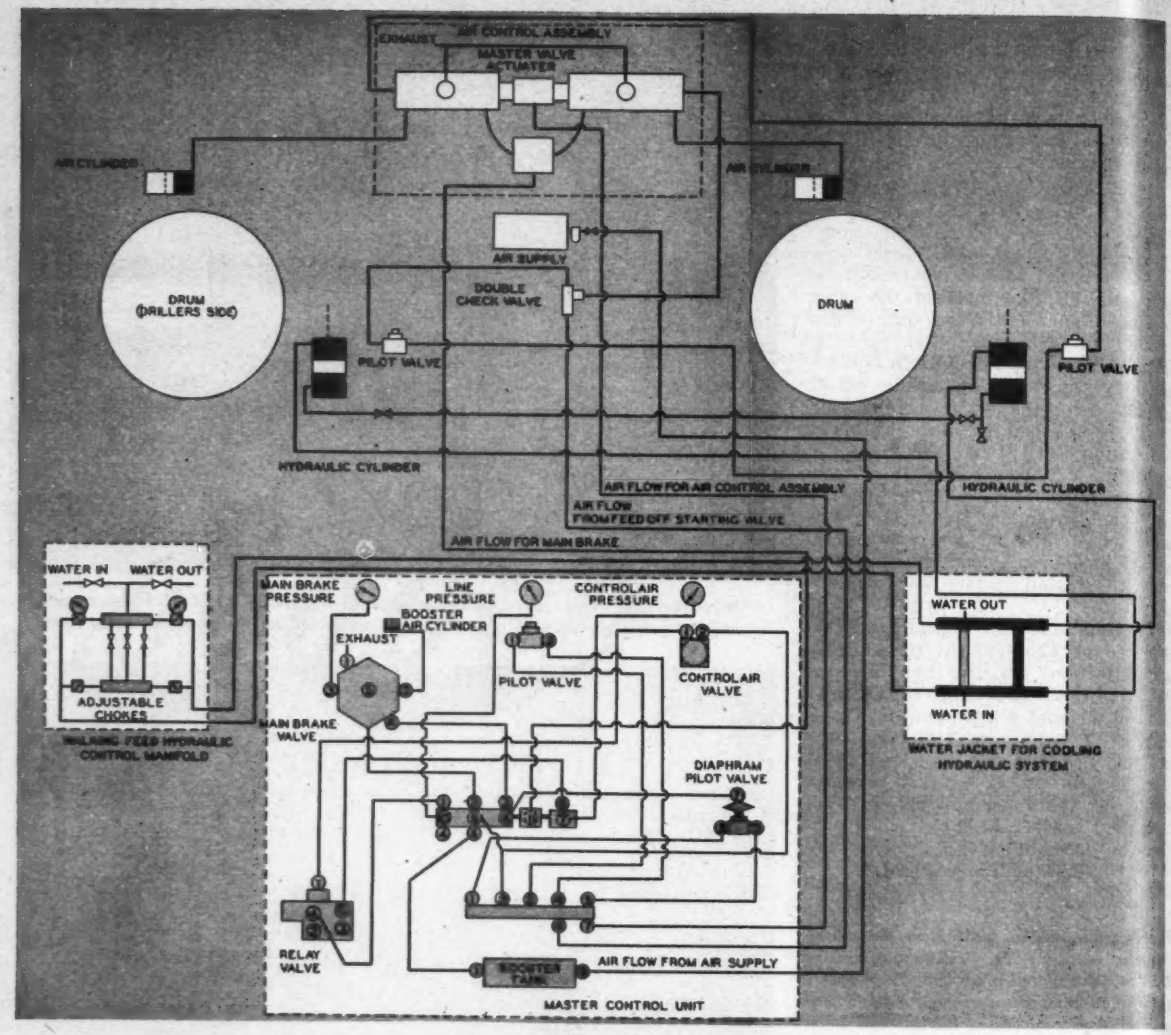


Fig. 1—Layout diagram of air-operated brakes

AIR-OPERATED BRAKES Successfully Used in Gulf Coast Drilling

by E. H. Short, Jr.

PERHAPS the most recent contribution toward the complete automatism of rotary drilling rigs, which seems to be taking place in the form of a gradual mechanical evolutionary process, is the air-operated drawworks brake and feed control.

Operators have gradually come to realize that the greatest single deterrent to safe and efficient operation lies in the considerable physical exertion required of rig personnel during certain phases of operation. The reduction in efficiency and alertness on the part of a drilling crew is known to be proportional to the exertion and physical fatigue incident to the performance of their tasks.

While the trend toward automatic control is expected to result in faster hole, the consensus among major operators and drilling contractors is that all possible measures for the reduction of crew fatigue should be incorporated in the design of drilling equipment primarily for the safety of the personnel, equipment, and the drilling operation itself.

During the past few years the equipment which constitutes a rotary rig for deep drilling has become massive and complex, and its operation has required an extremely fine degree of manual control which is not always available.

Powered brakes for draw works, and an integral means for controlling feed-off rates to the drilling bit have now been successfully applied to the drilling of Gulf Coast wells. A recent installation is on a major operator's rig now drilling in Galveston Bay.

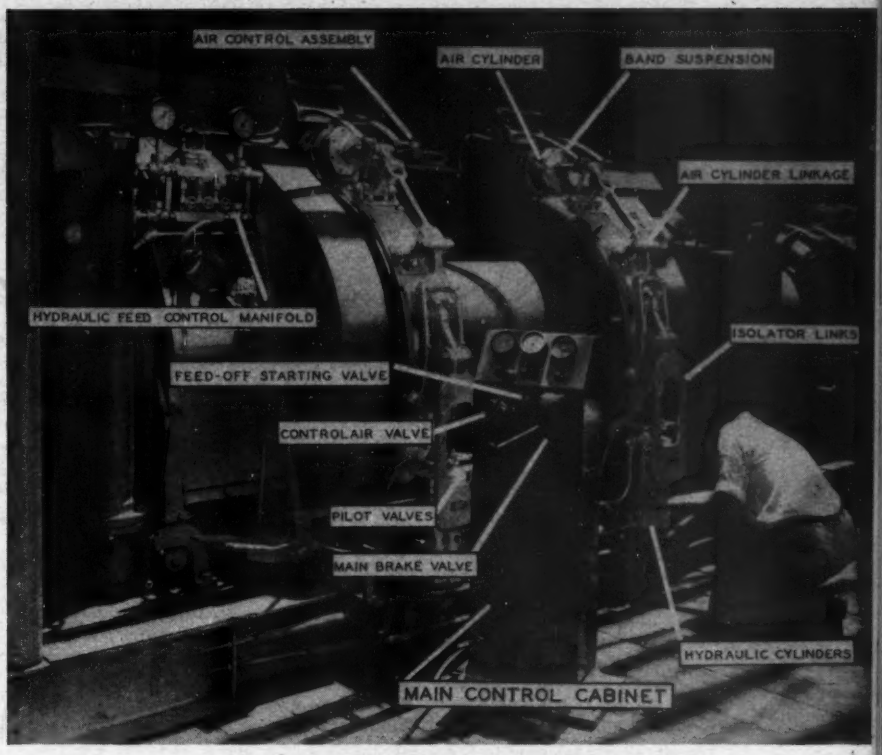


Fig. 2—Air-brake assembly as manufactured and installed by Kinzbach Tool Co., Inc., Houston. Field service man illustrates the engagement of mechanical isolator for releasing hydraulic system during normal braking operation. This installation is on a barge rig

Reduction of Manual Effort

Making trips with long strings of drill pipe requires that the driller apply his weight to the brake handle a great many times, and at short intervals. During these intervals between braking, he manipulates the engine throttle, often the rotary, the hoist clutches, and the cathead. An extremely high degree of coordination of effort is required, and it is important that the driller be alert in the performance of all these functions for the safety of himself, crew, and equipment. In the Galveston Bay operation the controls are placed in such a manner that the operator assumes a comfortable and relaxed position when using the brakes. Instead of going off balance as in the case of brake application of the old hand lever, the driller is able to apply the brake with a very slight movement and a minimum of effort.

Mechanics of Power-Operated Brakes

Hydraulically controlled, feedoff is accomplished by throttling fluid movement in a simple closed hydraulic system. The conventional hand brake is modified to leave the handle in its retracted position but always operable for emergency or auxiliary application. The hydraulic system will permit steady, even feedoff rates of 0 to 65 ft. per hour with 10 lines on the blocks. For higher rates of feedoff band slippage is sufficient and a graduating valve is provided to adjust air pressure to band cylinders to the desired rate. The hydraulic system is not used during this high rate of penetration.

The air-operated brakes are composed of seven major component units: The main control cabinet; the band assembly, driller's side; the band assembly, opposite side; the air-control manifold; the hydraulic assembly; the manual brake linkage, and the air supply.

Fig. 1 illustrates the general arrangement of the air and hydraulic system. The air supply is brought in to the auxiliary receiver located on the derrick floor. From there it is piped to the main control cabinet and pilot valve. Just inside the main control cabinet is placed a booster tank, or receiver, to insure ample supply of air directly at the controls. All main controls are mounted in a cabinet with appropriate gages, and are manifolded to energize the various circuits as required by the different operating cycles. Actual application of pressure to, and exhausting from, the air cylinder mounted directly on the band is controlled through the air-control assembly mounted between the banks and above the hoisting drum. Energization of lines from this assembly is accomplished either by manipulation of the controls in the main cabinet or of pilot valves, depending on the operational sequence selected.

Fig. 2 illustrates the appearance of the draw works equipped with the air brakes. The guard is modified just above the drum flanges to provide clearance for the air cylinders and their linkage, as mounted on the brake band. The standard hand-brake lever is shown in its normal, inactive position.

The main control cabinet (Fig. 3) is equipped with a main brake-valve

(Continued on page 90)

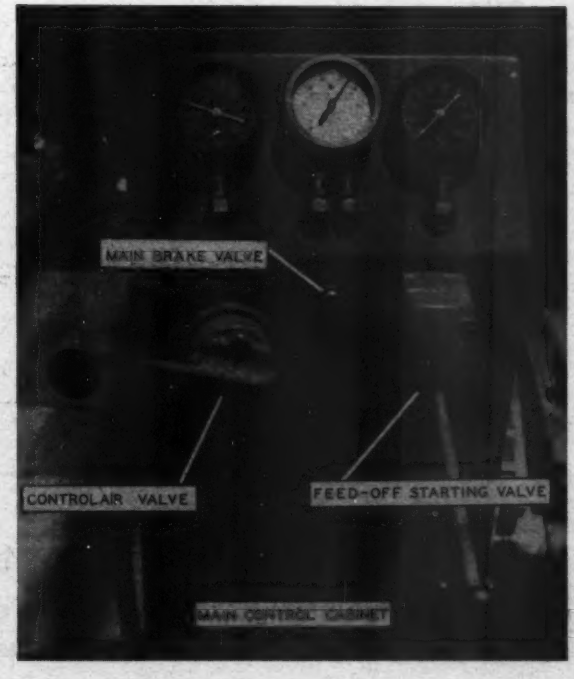


Fig. 3—Closeup of air-brake controls. Left gage shows control air valve pressure exerted by control air valve when in operation. When using hydraulic payoff, the control air valve is fully opened. This gives the full line pressure to the brake as indicated by the gage. The middle gage indicates the line pressure coming from the air-supply source to the control cabinet. The gage on right indicates air pressure exerted when applying the main brake valve

BILL
(Superintendent)

JOE
(Toolpusher)

BILL "Say, Joe — how come you took up so much time getting that inclination survey on N.C.B. No. 7? Appears to me as tho your drilling crews must have gone on strike."

JOE "Gosh, Bill, that record came up with a result that just couldn't possibly be right — that is if I know anything about drilling. If that hole had been that much off we'd never gotten the bit out."

BILL "Well, that's what you get for using one of those mechanically operated survey instruments."

JOE "How come?"

BILL "Because in mechanically operated instruments, you are liable to make a record *before* the plumb bob comes to a standstill. Way off the line!

"Why don't you get wise to the E-C Inclinometer. It records automatically and you can't get a record unless the plumb bob is standing still. So — there's no uncertainty — no new runs necessary — no time lost. That's why operators everywhere are turning to the E-C."

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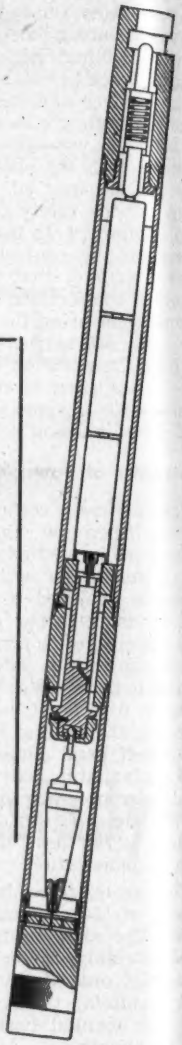
4. **As a Go-Devil and picked up with a core-barrel overshot.**
5. **Run in with a core-barrel overshot when picking up a core.**
6. **Run inside of bailer in cable tool drilling.**



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Location and Spacing of Wells For the R-1 Reservoir

*by Park J. Jones**

OIL PRODUCTION *by water*

PART 13 OF A SERIES

THE producing capacity at MER for the R-1 reservoir is 14,200 bbl. per day. About 60 producing wells saturate the reservoir. The optimum spacing for producing wells is the least distance between wells commensurate with depth. The optimum location for 60, or less, wells is within the 140-ft. contour. The optimum location for injection wells is along the water contact. A procedure for estimating producing and injection well capacities is indicated.

Productive Area

FIG. 13-1 shows the contours enclosing 1, 2, 3, and 4 thousand acres of productive area for the R-1 reservoir. The area within the water contact, zero-oil contour, is approximately 4,000 acres. The area within the zero-water contour, dashed contour in Fig. 13-1, is about 2,500 acres.

Fig. 13-2 is a N-S section through the center of the R-1 reservoir. The short vertical lines indicate the position of the 1, 2, 3, and 4-thousand-acre contours. The area initially underlain by water is about 1,500 acres. The pay thickness for the 1,500 acres ranges from zero up to 60 ft. The pay thickness for the area not underlain by water initially is 60 ft.

Area Above Water

Let water encroach updip in the R-1 reservoir. The productive area above water decreases progressively. The "a" curve in Fig. 13-3 shows the relationship between acres of pay above water and the elevation of the oil-water interface. The water contact is at zero elevation. The top of the pay along the crest is 200 ft. above the initial water level.

Pay Thickness for Developed Acreage

Suppose 1, 2, 3, or 4 thousand acres are developed. Let the development be on a uniform basis such as 10, 20, or 40 acres per well. The h curves in Fig. 13-3 show the average pay thickness above water. If 4,000 acres are developed, the initial pay thickness above water averages 48.1 ft. A rise in the elevation of the oil-water interface decreases the average pay thickness above water in accordance with the lowest h curve in Fig. 13-3.

The initial pay thickness for 3,000 developed acres is approximately 54.5 ft. A rise in the elevation of the oil-water interface decreases the average pay thickness above water in accordance with the Curve 3. After water rises 40 ft., the average pay thickness for 3,000 developed acres is the same as it would be if 4,000 acres were developed.

The average pay thickness above water for 2,000 developed acres is uniform at 60 ft. until water rises 20 ft.

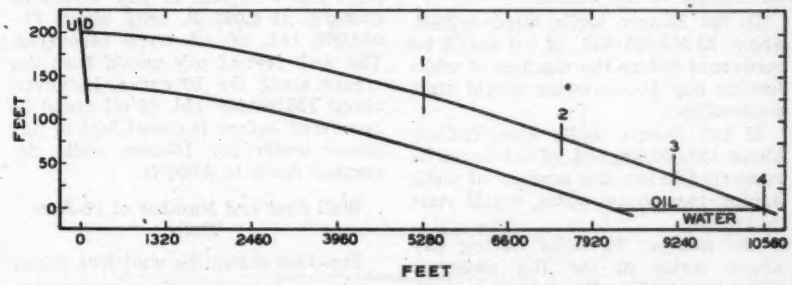

Fig. 13-2—N-S section through the center of the R-1 reservoir; vertical lines show the position of the contours enclosing 1, 2, 3, and 4 thousand acres of productive area

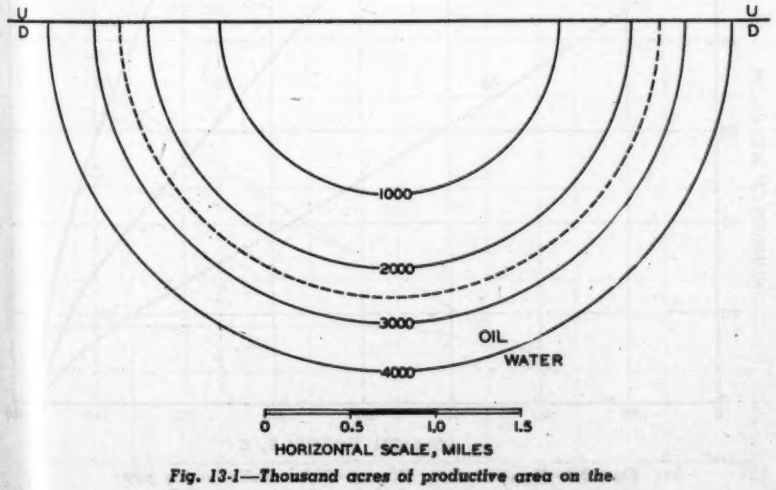

Fig. 13-1—Thousand acres of productive area on the R-1 reservoir; the dashed contour is zero-water

The average pay thickness then decreases along Curve 2 until the oil-water interface rises 80 ft. Above the 80-ft. relative level, the average pay thickness for 2,000 developed acres is the same as it would be if 4,000 acres were developed.

The average pay thickness above water for 1,000 developed acres is uniform at 60 ft. until water rises approximately 70 ft. The average pay thickness then decreases along Curve 1 until the oil-water interface rises about 127 ft. above the water contact. At still higher levels, the conditions are the same as they would be if 2, 3, or 4 thousand acres were developed.

Curve C in Fig. 13-3 shows the relationship between cumulative oil recovery and the elevation of the oil-water interface in the R-1 reservoir.

The number of wells having pay

*Production consultant, Houston.

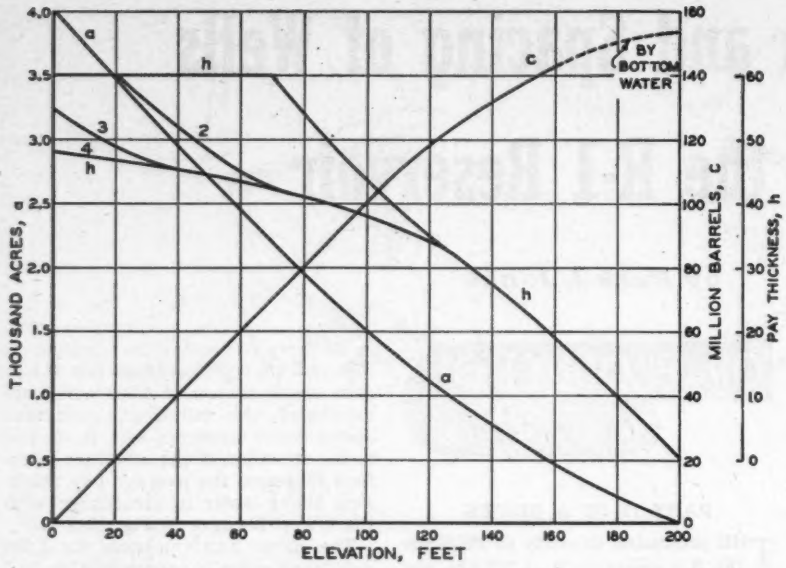

Fig. 13-3—Productive area above water (a), average pay thickness above water (h) for 1, 2, 3, and 4 thousand developed acres and cumulative recovery C vs. relative elevation of the oil-water interface in the R-1 reservoir

above water is shown in Fig. 13-4. The 40 curve shows the relationship between the number of 40-acre wells having pay above water and cumulative recovery. If 100 40-acre wells were drilled, the number of such wells having pay above water would start decreasing at the outset.

If 100 20-acre wells were drilled, about 79,000,000 bbl. of oil could be recovered before the number of wells having pay above water would start decreasing.

If 100 10-acre wells were drilled, about 122,000,000 bbl. of oil could be recovered before the number of wells having pay above water would start decreasing.

The number of wells having pay above water in the R-1 reservoir varies inversely with acres per well. When the cumulative recovery is about 122,000,000 bbl., there could be 100 10-acre wells or 50 20-acre wells or 25 40-acre wells having pay above water.

Well-Feet of Pay

Other things equal, the producing capacity of wells is proportional to well feet of pay. Fig. 13-5 shows the relationship between well feet of pay above water and cumulative recovery. One hundred 40-acre wells could be completed in 4,800 ft. of pay above the initial water level. But the well feet of pay would start decreasing at the outset. A cumulative recovery of 50,000,000 bbl. would reduce the well feet of pay above water down to about 3,000 ft.

One hundred 20-acre wells could be completed for 6,000 well feet of pay above water. The well feet of pay would be uniform at 6,000 ft. until about 21,000,000 bbl. of oil were recovered. The well feet of pay would then decrease along the 20 curve. However, about 100,000,000 bbl. of oil could be recovered before the well feet of pay above water for 20-acre wells decreased down to 3,000 ft.

One hundred 10-acre wells could be completed for 6,000 well feet of pay. The well feet of pay would be uniform at 6,000 ft. until about 71,000,000 bbl. of oil were recovered. The well feet of pay would then decrease along the 10 curve. However, about 126,000,000 bbl. of oil could be recovered before the well feet of pay above water for 10-acre wells decreased down to 3,000 ft.

Well Feet and Number of 10-Acre Wells

Fig. 13-6 shows the well feet of pay above water for 10-acre wells. Four hundred 10-acre wells could be completed in about 19,000 ft. of pay above the initial water contact. Three hundred 10-acre wells could be completed in about 16,000 ft. above water initially. Upon recovering about 40,000,000 bbl. of oil, the feet of pay above water for 400 wells would be the same as the feet of pay above water for 300 wells. In other words, the oil-producing capacity of 300 wells would be about the same as that of 400 wells upon recovering about 40,000,000 bbl. of oil.

Two hundred 10-acre wells could be completed for about 12,000 ft. of pay above water. The oil-producing capacity of 200 wells would be the same as that of either 300 or 400 wells upon recovering about 80,000,000 bbl. of oil.

The oil-producing capacity of 100 10-acre wells would be the same as that of 200, 300, or 400 wells upon recovering about 120,000,000 bbl. of oil.

Well-Producing Capacity

An equivalent three-row well system can have about 120 regularly spaced wells on a 360° radial reservoir. The R-1 reservoir has a 180° central angle. About 60 wells constitute a three-row system. The corresponding well capacity (see Parts 6 and 7) is given approximately by

$$Q = 15.7 \frac{3.07hK\Delta P}{\mu b \log \frac{2d}{r}} \qquad (1)$$

where 15.7 is the approximate interference factor for 60 wells and d is the distance from the first row of wells to the water contact.

Let 660 ft. be the least distance between surface locations required to obtain adequate distances between wells at the completion depth of the

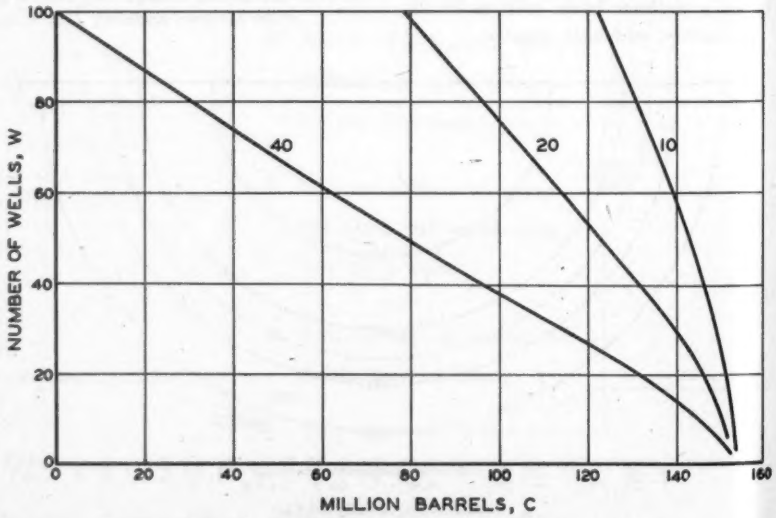

Fig. 13-4—Number of 10, 20, and 40-acre wells having pay above water vs. cumulative oil recovery from the R-1 reservoir

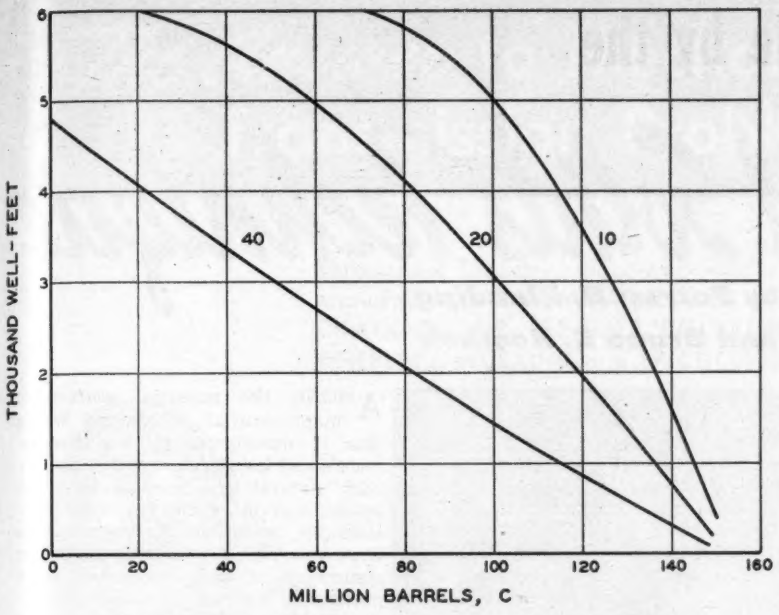

Fig. 13-5—Well-feet of pay above water for a hundred 10, 20 and 40-acre wells vs. cumulative oil recovery from the R-1 reservoir

TABLE 13-1—THE R-1 RESERVOIR PRESSURE FOR OIL WELLS

Millidarcys	100	200	400	600	800
Bottom-hole pressure, psia.	Reservoir pressure, psia.				
1,200	1,900	1,550	1,375	1,330	1,290
1,400	2,100	1,750	1,575	1,520	1,490
1,600	2,300	1,950	1,775	1,720	1,690
1,800	2,500	2,150	1,975	1,920	1,890
2,000	2,700	2,350	2,175	2,120	2,090

where Q is the oil-producing capacity of 60, or more, wells when the permeability of the reservoir-well system is K darcys, the reservoir pressure P, and the bottom-hole operating pressure P_b. Equation 2 is aside from oil production by expansion. Well capacity for production by expansion and displacement is higher than for displacement alone.

The reservoir capacity is 14,200 bbl. per day. The data in Table 13-1 show the reservoir pressure required to produce 14,200 bbl. per day against various bottom-hole operating pressures in 60, or more, wells. The permeability is the average value for the R-1 reservoir. Sixty wells require 600 developed acres. The distance from the center of the R-1 reservoir to the half circle which encloses 600 acres is about 4,080 ft. The distance to water is 10,560 ft. Hence the value of d is about 6,500 ft.

Let the wells have an 8-in. diameter. The value of r is then equal to one-third. So log 2d/r is log 6(6,500) or 4.59. The pay thickness is 60 ft. The product of viscosity and volume factor is 2.8(1.11) or 3.11. Upon substituting these values in Equation 1, we have

$$Q = 204K\,(P - P_b) \qquad (2)$$

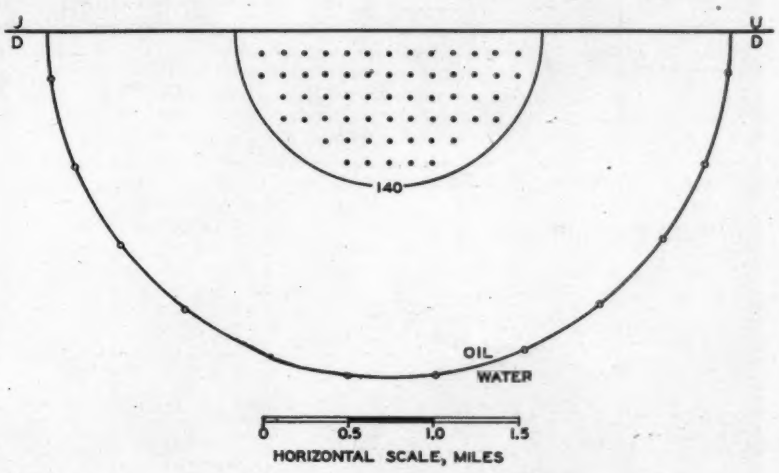

Fig. 13-7—(Above) Showing the location of sixty 10-acre producing wells and twelve injection wells located on the water contact

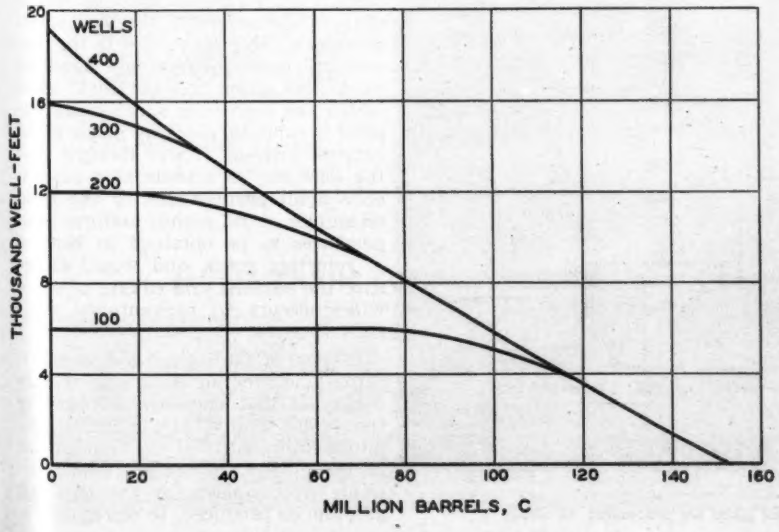

Fig. 13-6—(Below) Well-feet of pay above water for 10-acre wells vs. cumulative oil recovery from the R-1 reservoir

reservoir-well system. The minimum bottom-hole operating pressure relative to no free gas is the 1,200-psia. saturation pressure.

Injection Capacity

Suppose injection wells are located along the water contact of the R-1 reservoir. Such wells constitute a one-row system. The injection capacity is defined approximately by

$$Q = \frac{1.96nhK\,(P_w - P)}{\log \frac{2d}{r}} \qquad (3)$$

where n is the number of injection

(Continued on page 105)

Retorting Oil Shale by the

Fluidized Solids Technique

by Forrest H. Blanding
and Bruno E. Roetheli

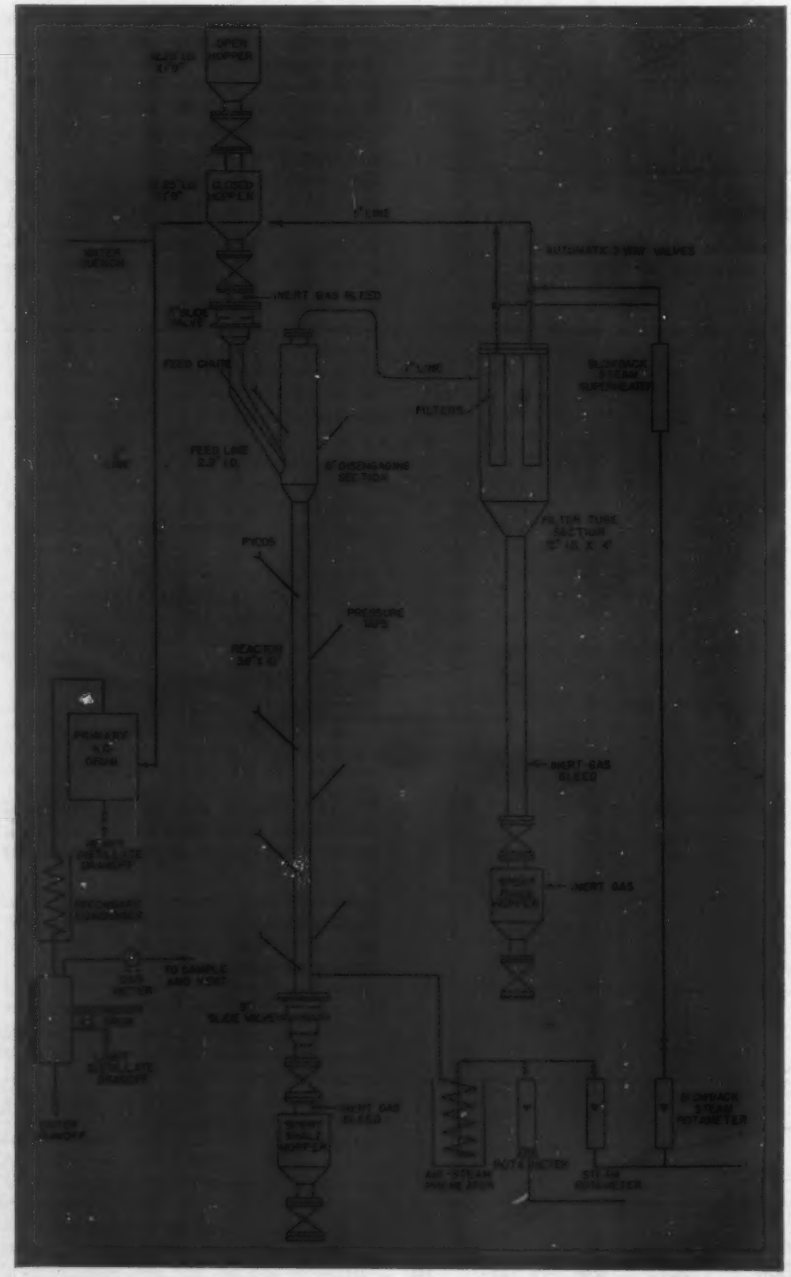

Fig. 1—Flow plan of experimental pilot plant for processing oil shale

AMONG the potential sources of manufactured oil during World War II investigated by the Government's and industry's research groups, coal, natural gas, tar sands, wood waste, and oil shales received considerable attention. A few of these were considered promising from the standpoint of early exploitation. In particular, the rich oil shales in eastern Australia offered immediate advantages in the strategic sense. Australia, being an important base for Allied military and naval operations, served as an oil supply depot for Pacific operations to which oil was being shipped by tanker from the United States. When making such shipments, tankers not only had to return empty, but had to carry their own fuel for return trips as well as for the westward crossings. This practice reduced useful load capacities. Government authorities considered the use of native sources of oil in Australia as extremely desirable in that fewer ships would have to run the gauntlet of enemy submarines or in that greater quantities of oil could be made available to the armed forces in the shipping capacity available.

Early in 1942, therefore, Standard Oil Development Co. undertook to investigate the possibility of manufacturing marine fuel oil in sizable quantities from Australian shale by means of its newly developed fluidized solids technique. This technique is the important new method of handling solids and gases in the "fluid" state which has been very successfully applied to catalytic cracking in the Fluid catalyst process. It was thought that the handling of a shale to a reasonably small particle size by the fluid technique would permit uniform temperatures to be obtained in heating or retorting zones, and would eliminate the sticking and caking of shale which occurs in conventional nonfluid systems.

In view of the lack of a steel fabricating industry in Australia, it was suggested that commercial retorting should be limited to the use of the minimum quantity of steel equipment necessary and, in view of the relatively poor quality of the shale-oil gasoline as produced, to disregard re-

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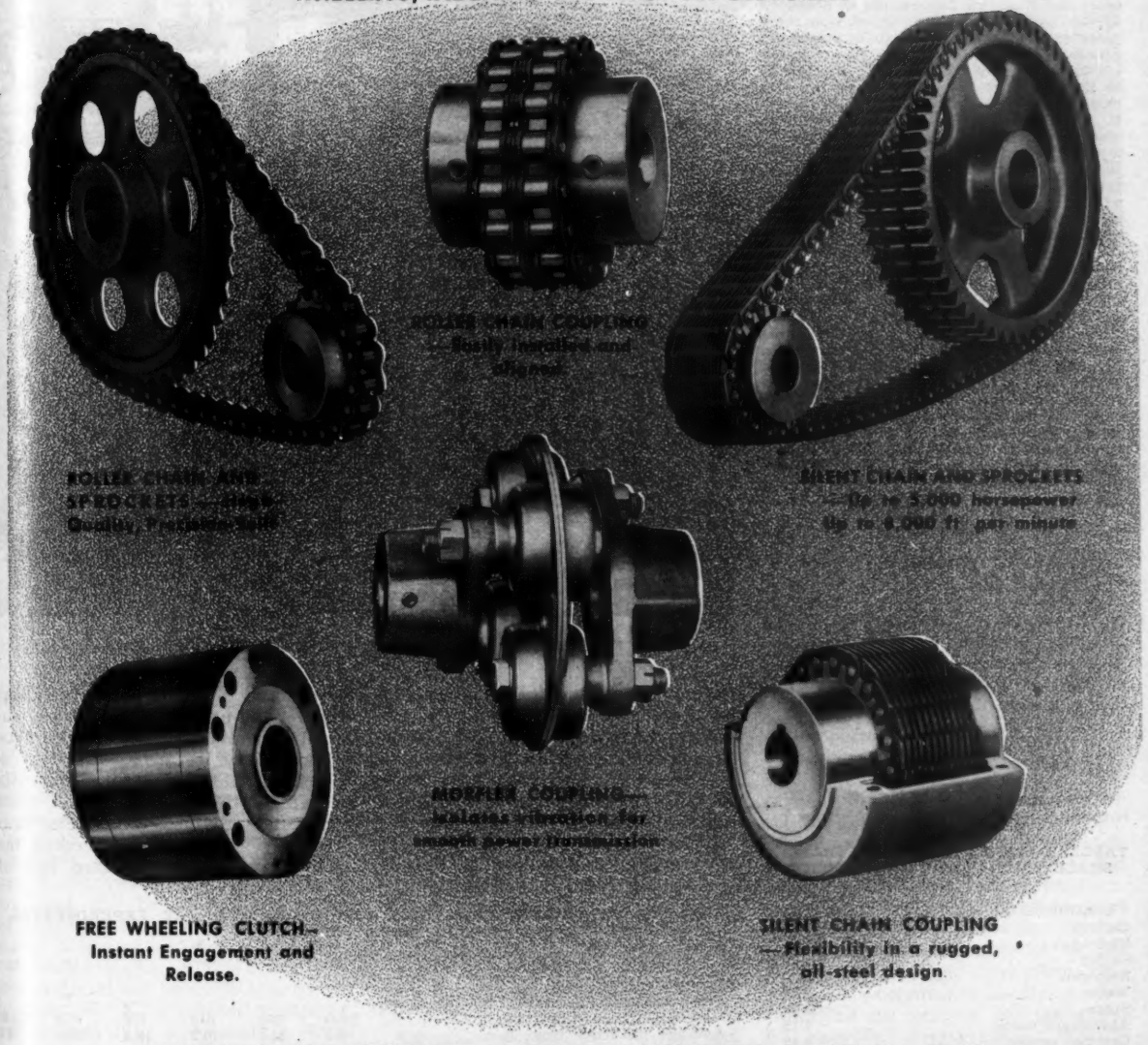

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B. ROETHELI

Bruno E. Roetheli joined the Development and Research Department of Standard Oil Co. of Louisiana in 1935, working for 4 years on process developments in petroleum refining. He was transferred to a London affiliate in the spring of 1939, but returned to the U.S.A. at the outbreak of the war to join the Esso Laboratories at Elizabeth, N. J., and was for 6 years engaged in economic studies in connection with development of processes for manufacturing aviation gasoline, toluene and for the manufacture of substitute fuels. He is currently with the new research group, Esso Development Co., Ltd., in England which conducts researches for and assists Standard Oil Co. (N. J.) European manufacturing and marketing companies on technical problems arising in their territories.

Forrest H. Blanding has been with Standard Oil Development Co. in Elizabeth, N. J., since 1940. He has been engaged in petroleum refining process development work. In addition to the work described in this article on shale retorting, Blanding has worked on the development of such processes as isomerization, hydroforming, catalytic cracking, and is currently supervising correlation and special study work, principally in connection with the fluid-catalyst cracking process.

covery of light products beyond the quantities necessary for supplying the necessary utilities for the operation of the plant. This paper is a report on the new process developed and includes, in addition to a brief description of the process, a summary of pilot-plant results obtained during the experimental processing of the Australian oil shale.

Nature of the Shale Used

As is generally known, it is customary to remove oil from shale by heating the shale to temperatures in the order of 700°-1,000° F. Oil vapors evolve readily from shale at these temperatures, whereas it is extremely difficult or impossible to remove the oil at atmospheric temperatures by solvent extraction methods.

When the oil shale used in this work was heated in a glass tube, a semiplastic state occurred at about 825° F., and agglomeration of the material took place in a fixed-bed type of operation. However, operation in the fluidized solid state apparently prevented this agglomeration from occurring, provided the reactor was originally started up by feeding the fresh shale into a fluidized bed of

TABLE 1—ANALYSIS OF AUSTRALIAN SHALE USED IN THE EXPERIMENTS

Constituent—	Wt. per cent of shale
Carbon	63.12
Hydrogen	7.87
Sulfur	0.70
Nitrogen	0.40
Water	0.60
Silica	23.30
Aluminum oxide	1.15
Calcium oxide	0.15
Loss	2.71

TABLE 2—RESULTS OF BATCH COKING EXPERIMENTS

Distillate produced, wt. per cent on shale	45.1
Wet gas, wt. per cent on shale	4.9
H_2O, wt. per cent on shale	0.6
Inspections on distillate:	
Gravity, °A.P.I.	35.9
Acid heat, °F.	124
50 per cent distilled at, °F.	504
Per cent nitrogen	0.79
Per cent sulfur	0.57

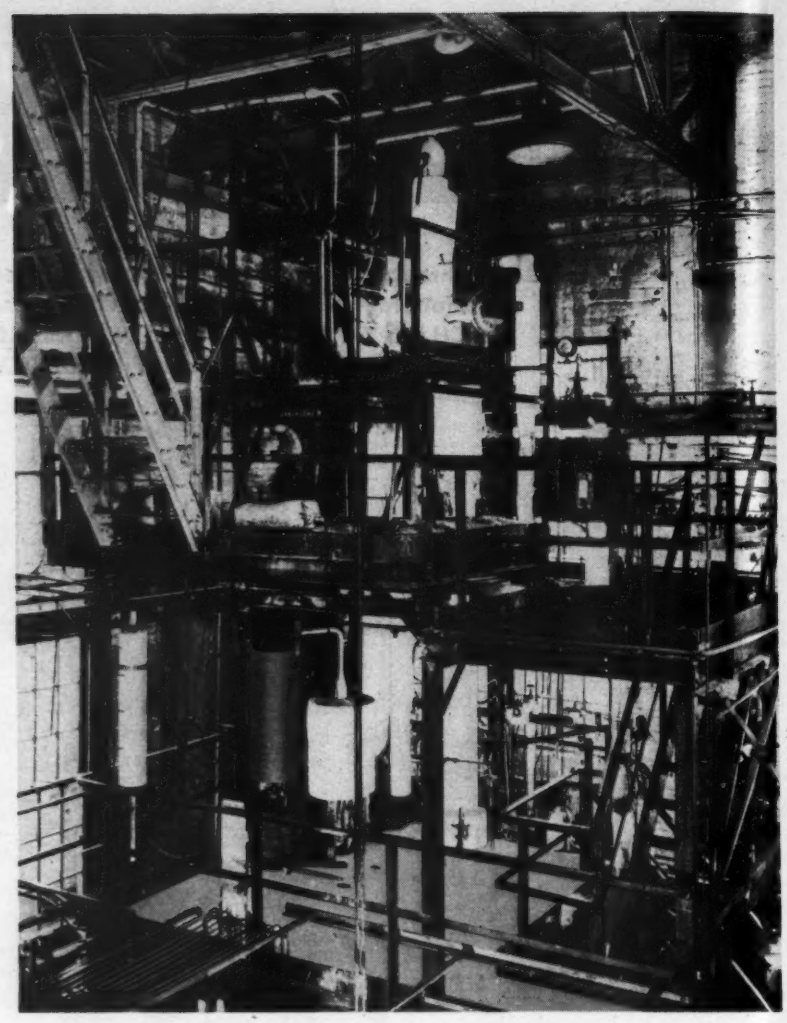


Fig. 2—Photograph of pilot unit for recovery of oil from shale

TABLE 3—YIELDS AND OPERATING CONDITIONS FOR THE EXPERIMENTAL OPERATIONS

Run No.—	5	6	8	9	10	11
Operating conditions:						
Fresh shale, lb./hr./sq. ft. reactor cross-section	1,230	881	916	776	912	1,120
Average residence time, min.	8.7	11.4	10.2	13.2	10.9	9.0
Air, M.c.f./ton of shale (at 60° F. and 1 atm.)	10.1	13.9	13.3	15.8	13.4	10.9
Superficial gas velocity in reactor,* top, f/s	3.8	4.0	3.9	3.9	3.3	3.9
Average reaction temp., °F.	912	960	953	1,004	944	896
Temp. of inlet air	373	389	350	351	348	350
Yields, based on shale charged:						
Wet hydrocarbon gas, wt. per cent	5.4	9.3	12.3	17.1	11.0	5.7
Recovered crude oil, bbl./ton	2.72	2.62	2.50	2.27	2.52	2.68
Spent shale, wt. per cent	48.7	44.7	44.6	40.3	44.9	48.8
Carbon burned, wt. per cent	3.9	2.4	2.0	4.0	2.3	1.6
Hydrogen burned, wt. per cent	1.3	0.9	0.8	0.5	0.6	0.8

*Includes stripped oil vapors.

spent shale or other dry particles preheated to reaction temperature.

The specific oil shale used in the laboratory experiments was a very rich Australian oil shale containing about 63 per cent carbon and 8 per cent hydrogen by weight. An average analysis of the shale is given in Table 1. The shale was crushed to a maximum particle size of about ¼ in. for the experiments.

As an indication of the amount of oil recoverable from this shale, a conventional small-scale batch-retorting operation was carried out. The weight of oil recovered by this test was equivalent to about 44-47 weight per cent on shale, and the oil appeared to be considerably higher in A.P.I. gravity than the oil recovered by the fluid-distillation method. Inasmuch as the shale oil cracked readily at temperatures as low as 550° F., it appeared that oil from the batch-still operation was thermally decomposed to a much greater extent than that obtained when using the fluidized solids technique. Data obtained from the batch retorting test are given in Table 2.

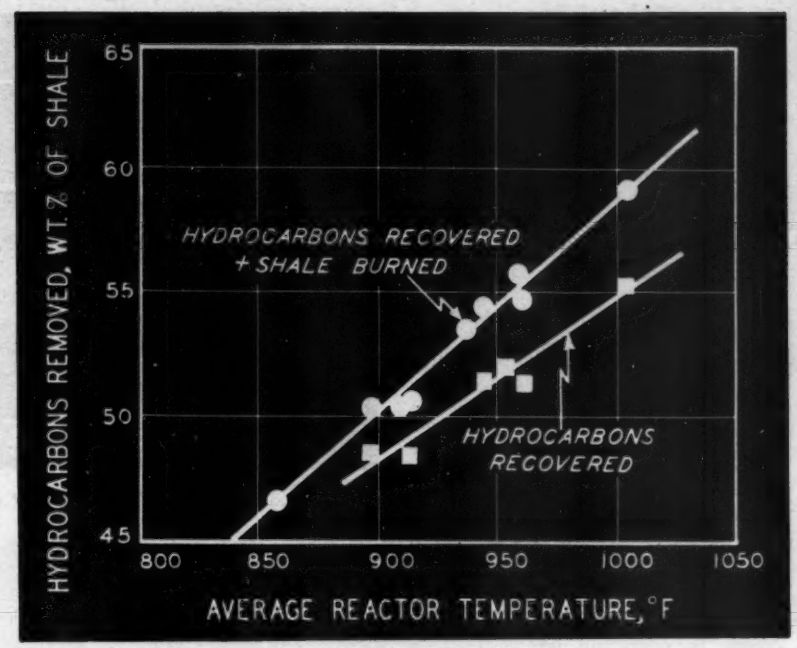


Fig. 3—Yield of hydrocarbons produced

Pilot Plant

Experimental equipment. — A simplified flow sheet of the pilot unit which was used in most of the operations is presented in Fig. 1. The shale distillation reactor consisted of a 4-in. vertical retort, 10 ft. high, which in normal operation contained a fluidized bed consisting principally of shale ash. This bed was maintained in a fluidized condition by air or by an air-steam mixture which was injected into the bottom of the reactor. The air burned a small portion of the carbon and hydrogen remaining on the spent shale and probably some of the distilled oil vapors to provide the heat necessary for the distillation. Fixed gases and oil vapors passed from the 4-in. reactor section up through a disengaging section of 8-in. pipe, from the top of which they passed into the filter section. Most of the shale fines carried over from the reaction bed were removed in the filter section, and gases thence passed through a partial condenser in which the products were cooled to approximately 300° F., separating a part of the highest-boiling oil without condensing any of the steam. The remainder of the products was cooled to about 90° F. in a total condenser, and passed into a separating drum from which water, oil, and gas could be withdrawn and analyzed.

Fresh shale was fed to a lock hopper situated above the reactor. Beneath this hopper was a reciprocating slide valve through which were fed small charges of fresh shale to the reactor. Fresh shale entered the reactor at the bottom of the disengaging section and dropped into the fluidized reaction bed. The shale-feed hopper and chute were heated to about 250° F. to prevent water condensation. The spent shale was withdrawn through another reciprocating slide valve at the bottom of the reactor into another lock hopper from which it was periodically removed. Photograph of the unit is given in Fig. 2.

The reactor and filter sections were wound with electrical heaters which were used to compensate only for heat losses to the atmosphere. This allowed the reactor to operate adiabatically so as to simulate as closely as possible the conditions in a commercial unit. Provisions were made to preheat the fluidizing gases to operating temperature.

The very intimate mixing of the fluidized solid bed permitted very rapid heating of both shale and air in the reactor. Relatively constant and easily controllable operating temperatures could be maintained within the bed. The maintenance of a mixed fluid solid bed is essential to this type of operation inasmuch as in a stationary bed or countercurrent nonfluidized operation hot spots would develop at the air inlet which would form large clinkers; these would plug the unit.

Operating conditions. — Yields and operating conditions for some of the experimental operations conducted are given in Table 3. These operations include runs at retorting temperatures ranging from 850°-1,000° F. The charge rates to the reactor were varied between 500-1,250 lb. shale per hour per square foot of reactor cross-sectional area. These rates are quite high compared with those possible with conventional commercial retorts in which throughputs of only one-sixth to one-twentieth of the above maximum feed rate are normally obtained. Rates of feed in excess of 1 ton per day were successfully maintained in the 4-in. retort. Provision for external preheating of the specific shale used, not available in the pilot plant, would make possible substantial increases in feed rates to the reaction vessel.

Removal of hydrocarbons from shale. In Fig. 3 is presented a plot of the weight per cent of total oil plus hydrocarbon gases removed plus hydrocarbons burned from the shale versus operating temperature. This figure shows that the removal of the hydrocarbon is a function principally of temperature. No significant effect of variations in residence time from 8-20 minutes on the rate of removal of oil from the shale was evident from the data obtained.

The total weight per cent of crude oil and hydrocarbon gases removed is also plotted against reactor temperature, in Fig. 3. It is of interest to point out that operations were also carried out in which a mixture of 50 per cent air and 50 per cent steam was used. In experiments in which this fluidizing gas mixture was preheated to reaction temperature, slightly greater yields of hydrocarbons were observed, and in experiments in which the air-steam mixture was preheated only to 350° F., slightly lower yields of hydrocarbons were obtained than were recovered in the base operations with air only at 350° F. This observation reflects the fact that more hydrocarbons were necessarily burned to supply heat when the extraneous fluidizing gas was unpre-

heated, and less oil was burned when the gases were preheated. The sum of hydrocarbons recovered plus hydrocarbons and carbon burned was essentially constant in all experiments at a given reaction temperature and no advantage was indicated for using other fluidizing gases in addition to the air required for heating.

Products from the operation.—A relatively high-boiling oil was obtained from these operations. Roughly 15-25 per cent of the recovered oil boiled in the gasoline boiling range and 40-50 per cent distilled above 800° F. The oil had a gravity of 20°-25° A.P.I., contained 0.5-0.7 weight per cent sulfur and showed a carbon residue of 3-8 per cent. The oil could be made suitable for marine fuel oil by topping to remove a small quantity of lower-boiling components in order to meet flash and fire point specifications. Inspections of the crude oil recovered are given in Table 4.

The yield of total crude oil produced decreased slightly with increase in operating temperature in spite of the fact that the total hydrocarbon yield increased with operating temperature. This is attributed to a greater rate of thermal cracking of the shale oil at higher temperatures which result in the production of more gasoline and gas. Crude-oil yields from the operation are plotted in Fig. 4.

The hydrocarbon gas yields increased from 4.5-15.2 weight per cent on shale as the reactor temperature was increased from 850°-1,000° F. Typical analyses of the gases are given in Table 5. Although appreciable quantities of C_4, C_5 and higher-boiling hydrocarbons were present in the gas, the large amount of diluent gas would make the recovery of these hydrocarbons difficult in the type of operation used. This gas (200-250 B.t.u. per cu. ft.) could, however, be used for industrial purposes.

An alternative method of design, however, would eliminate the large amount of inert gas in the hydrocarbon gases, and would make possible the production of a gas of high heating value. In this design the spent shale would be burned in a separate vessel, and the shale in the retorting vessel would be fluidized and stripped with steam. Recirculation of the shale from the burning vessel, maintained at a somewhat higher temperature than the retorting vessel, would supply the heat required for the process. It might reasonably be expected that a somewhat higher oil yield would be obtained by this modification in design. As has been previously mentioned, however, the necessity for keeping steel consumption to a minimum in the specific problem being studied required the use of the single vessel type of design.

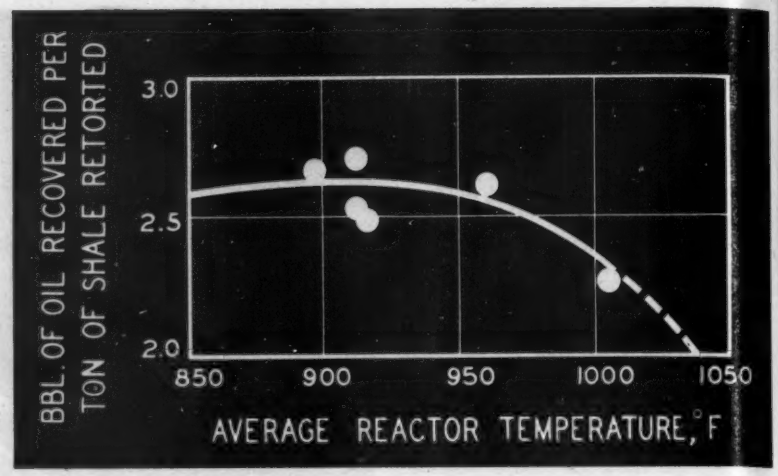


Fig. 4—Yield of crude oil produced

Spent shale.—The spent shale from these operations, containing 33.5-43.2 weight per cent of residual carbon and 1.2-2.7 weight per cent hydrogen, would have a good heating value. The heating requirement for the process itself was only a small fraction of the heat which could be made available by burning the spent shale. The total amount of shale burned varied from 2-5 weight per cent for the range of experimental operations covered. Although the original shale was hard, the spent shale was quite friable, and considerable reduction in size took place in the reactor.

For disposal of the spent shale it is anticipated that it could be conveyed in pipes in the fluidized state directly to a suitable disposal dump. Also, there is the possibility that it could be converted to water gas for conventional use, or for the synthesis of gasoline and other products.

Air requirements.—Air requirements in the pilot-plant operations increased from 9,000 cu. ft. per ton of shale distilled at 850° F. reactor temperature to 15,600 cu. ft. at 1,000° F. distillation temperature for operation with air only at 350° F. preheat. The air requirement for a given shale is dependent upon the amount of preheat supplied the entering reactants, and also upon the amount of fluidizing gas used in addition to air. The actual net heat requirement of the process is comparatively small.

Shales of lower oil content.—Shales found in the United States are of lower oil content than that from Australia which was used in these experiments. However, American shales can be successfully handled by the process. Shales of lower oil content will have lower specific heats and will require less fuel per pound of shale for vaporization, so the shale could be fed at higher feed rates than were used in these operations.

TABLE 4—INSPECTIONS OF CRUDE OIL PRODUCED

Run No.—	5	6	8	9
Gravity, A.P.I.	25.1	21.9	22.4	20.5
Sulfur, weight per cent	0.53	0.60	0.60	0.64
Conradson carbon, per cent	3.2	6.7	6.1	8.0
Sediment by filtration, per cent	0.02	0.01	0.02	0.01
Distillation, °F., at 2 per cent off	242	265	230	252
5 per cent	269	310	264	270
10 per cent	375	375	372	311
20 per cent	488	422	452	428
30 per cent	586	552	529	508
40 per cent	725	...	602	610
50 per cent	835	...	692	...
60 per cent	...	...	796	...

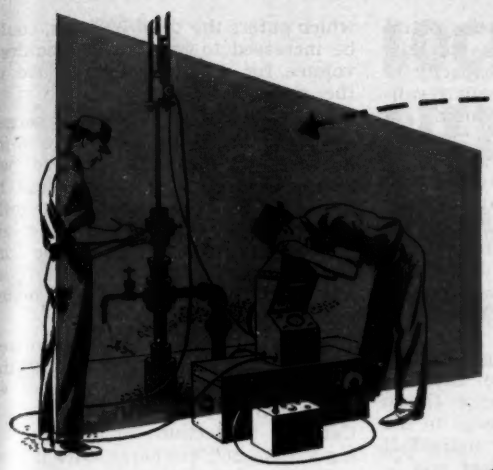
TABLE 5—ANALYSIS OF HYDROCARBON GAS PRODUCED

Run No.—	6	8	9	10	11
Hydrogen, weight per cent	0.8	0.9	0.3	1.8	1.7
Methane, weight per cent	14.9	12.5	23.6	15.1	9.8
Ethylene, weight per cent	17.5	10.7	8.7 }	29.7	12.2
Ethane, weight per cent	8.9	10.8	9.9 }		12.5
C_3 hydrocarbons, weight per cent	17.5	19.8	21.1	19.3	21.1
C_4 hydrocarbons, weight per cent	13.9	19.6 }	36.4	34.1	42.6
C_{5+} hydrocarbons, weight per cent	26.5	25.7 }			

Process Design

Based on experimental data a preliminary process design was prepared for the manufacture of fuel oil from Australian oil shale by the fluidized solids technique. For this purpose the single vessel system was considered. Air is blown continuously through the fluidized mixture of fresh and spent shale at controlled rates commensurate with the heat required for preheating, drying, and retorting the shale and preheating the fluidiz-

(Continued on page 96)



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Pressure Maintenance At Richard King

(Continued from page 77)

start of pressure-maintenance operations was approximately 820 bbl. of oil, 1,403,000 cu. ft. of gas, and 35 bbl. of water. Production gas-oil ratio averaged 1,710 cu. ft. per barrel and dissolved gas-oil ratio 550 cu. ft. per barrel.

Based on an average sand porosity of 27 per cent, connate-water content of 32 per cent, and an oil-shrinkage factor of 28 per cent, the reservoir contained originally an estimated 5,200,000 bbl. of stock-tank oil in place. Permeability runs around 600 millidarcys, with which it was figured that the dissolved-gas drive would permit a recovery not to exceed 35 to 40 per cent of the oil in place. By injection of gas to the free-gas zone to occupy reservoir space equivalent to that voided by current withdrawals of oil and gas it is hoped to maintain pressures and convert or modify the dissoved-gas drive to a gas-cap drive. This, it is expected, will increase the recovery factor of from 35 to 47 per cent and result in an increase in ultimate recovery of at least 625,000 to 650,000 bbl. of oil over that possible with a dissolved-gas drive.

Depletion Mechanism

Fundamental reasons for this are well established. A dissolved-gas drive is essentially a depletion mechanism in which as the gas comes out of solution and is depleted it leaves from 60 to 90 per cent of the oil behind. The oil zone retains its original size and shape with the final oil and gas saturation being dispersed substantially uniformly throughout the zone. In the case of a gas-cap and/or water drive the oil zone shrinks but remains an oil zone until exhaustion and retains original saturation except part progressively disappears by invasion of gas and/or water. Displacement by gas-cap and/or water drives can result in ultimate recoveries up to 80 per cent of the oil in place.

The well selected for gas injection is located at the structurally highest position in the sand. In this well (C-2 King) a substantial portion of the sand is above the gas-oil contact where the gas is being injected in the free-gas zone to be utilized not only to occupy space voided by withdrawals but also to hold and avoid dispersion of the oil zone. It had been completed initially as a high-ratio well and had been shut in until converted to input use. Sand in this well was unusually well developed and otherwise it possessed good injection characteristics.

Frequent periodic bottom-hole-pressure surveys will be made as a phase of the project and close watch will be made of gas-oil ratios of individual wells. So that gas production will not exceed the capacity of the reservoir, high-ratio wells resulting from the gradually expanding gas cap will be shut in and their allowables transferred progressively to structurally lower wells. By this program it is anticipated that not only will the ultimate recovery be increased but the flowing life of the sand will be lengthened substantially and lifting costs greatly decreased.

Twenty-three wells are being produced from the sand at this time. The production is being handled through six central lease batteries from which the low-pressure (75 to 100 psi.) flare gas is delivered to the compressor plant through individual gathering lines, consisting of one 5-in., three 4-in., and two 2-in. lines. At the plant the gas is manifolded to a single 6-in. inlet line, metered and compressed in three stages to 2,000 psi. for return to the producing sand.

Makeup gas to supplement the sand's production gas in maintaining reservoir pressure is supplied from a single high-pressure gas well (C-17 King), located 5,100 ft. northwest of the plant. This well, completed in a different sand, is the only well so far in that sand and is produced solely to supply the makeup gas. It has a flowing pressure of 1,760 psi., which is reduced in two-stage separation for recovery of any liquids, now 15 to 19 bbl. of distillate daily. Gas for pressuring is taken off the first-stage separator, operated at 800 psi. pressure, and introduced, after plant metering, to the suction of the third-stage compression cylinder at approximately 700 psi. pressure with the production gas from the second-stage compression cylinder. As a precaution against a possible carryover of liquids from the 800-psi. well separator, a high-pressure scrubber is installed on the makeup-gas inlet line at the plant.

At this time the required capacity is handled with one Clark angle-type 400-hp. engine compressor, equipped with three compression cylinders and designed for three-stage operation. The first and second cylinders are fitted with clearance pockets which may be opened or closed to suit variations between 75 and 100 psi. in suction pressures of the flare gas. Design pressures between stages are 75-100 psi. suction to 240-290 psi. discharge for the first cylinder; 235-285 psi. suction to 710-770 psi. discharge for the second cylinder, and 705-765 psi. suction to 2,000 psi. discharge for the third cylinder.

The piping manifold for the compressor cylinders is arranged to permit the disposal of the flare gas from the second stage to gas utilities operating nearby pipe lines at 700 psi. In that event the quantity of makeup wet gas from condensate wells, which enters the third cylinder, could be increased to provide the required volume for pressure maintenance in the upper 5,400-ft. oil reservoir.

The final-stage cylinder discharges the 2,000 psi. gas direct to a 3-in. header, which in turn splits to two 2-in. buried parallel return lines to the input well, located about a mile from the plant. At the well, the latter two lines again come to the surface and converge into a single 3-in. line with a lube-oil trap and meter run to the well.

Interstage cooling of compressed gas is accomplished by passage of the gas through coils in the base of an atmospheric water-cooling tower. Cathodic protection for the gathering system and discharge lines is provided by a copper oxide rectifier.

Air-Operated Brakes

(Continued from page 79)

lever, control air-valve knob, feedoff trip pilot valve, and gages. When the handle is latched in the first horizontal notch in the cover, sufficient pressure is applied to the bands to support the block, hook, kelly, and one stand of pipe. Brake is latched at this position while making up or breaking out a drill string connection.

When the pipe is in the hole and drilling operations are in progress, two methods of feeding off the drill pipe are available. Selection of the method to be used depends on the penetration rate, but change from one to the other, or to a combination of both, can instantly be made at any time.

For drilling rates above 65 ft. per hour, which is the maximum rated capacity for the hydraulic system, feedoff is accomplished by regulation of the braking effort for the desired rate of slippage. When it is known that this higher rate will be maintained it is not necessary to release the isolators, since engagement of the hydraulic system will not be required.

To regulate braking effort, the main brake valve is applied at the point where resumption of drilling operations is desired, and the control air valve (Fig. 3) is opened to the full line pressure.

Where drilling rates are to be within the range of the hydraulic system, 0 to 65 ft. per hour with 10 lines, it is necessary to release the isolators (Fig. 2) before this system can be placed in action. This is done while the pipe is suspended on the rotary slips just prior to making the last connection in the string. A "walking" exhaust control valve, which fixes the rate at which the disengaging brake band disengages while its opponent is engaging, assures a continuous, smooth feedoff of the drilling line.

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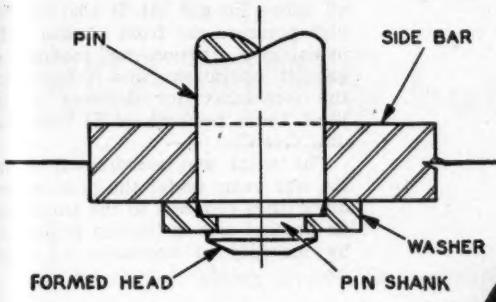

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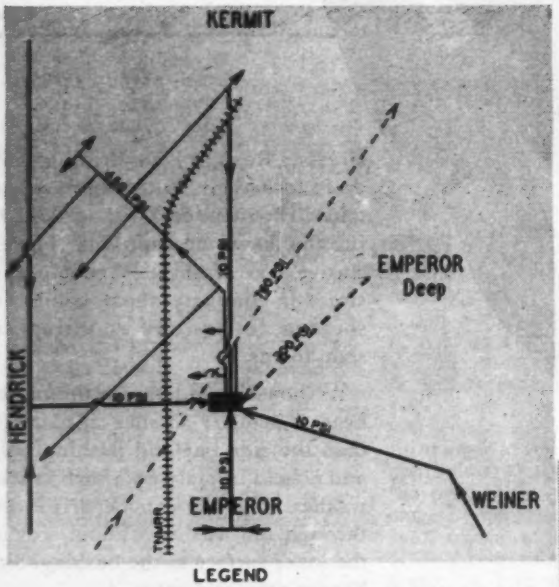
Small Flexible Gas System aids Conservation

by George Weber

A SMALL but important part in the growing program of gas utilization in West Texas is played by the Heidrich-Lyman Plant No. 1 of the Lyman Natural Gas System. Operating on a small scale since its completion late last summer, the project shows promise of expansion both as to capacity and variety of product. It is a good example of the possibilities for greater gas conservation and the opportunities for chemical manufacture in the Permian basin.

Located near the town of Wink in Winkler County, the gasoline plant processes low-pressure casinghead gas from four nearby oil fields, returning high-pressure residue gas to oil leases for gas lift. It also receives high-pressure gas from six gas wells, utilizing a fraction for makeup on gas-lift operations and compressing the remainder for delivery to the West Texas network of El Paso Natural Gas Co.

The plant was constructed during the war years under the procurement difficulties common to the times, and its present size is limited principally by inability of operators to obtain



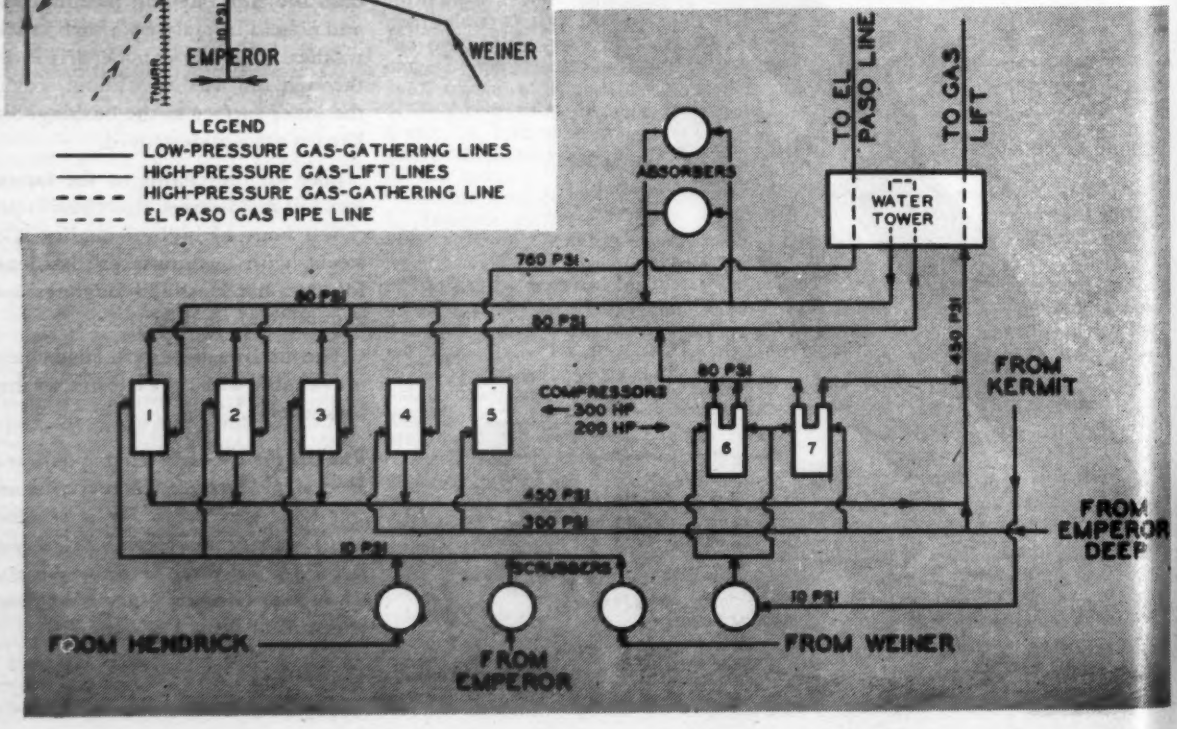


Fig. 1—(Left) The plant location in central Winkler County places it in close proximity to a number of oil and gas fields. Within a 6-mile radius of the plant are over 1,000 producing oil and gas wells in 5 fields. Here are shown existing and proposed gathering lines for casinghead gas, the high-pressure residue gas network serving gas lift leases, the gas-supply line from Emperor Deep, and the outlet to the El Paso gas pipe line. Fig. 2—(Below) This schematic gas flow diagram illustrates the flexibility of plant operation. The supply of 450-psi. gas for gas lift can be maintained by addition of dry gas regardless of the volume of low-pressure casinghead gas flowing to the plant

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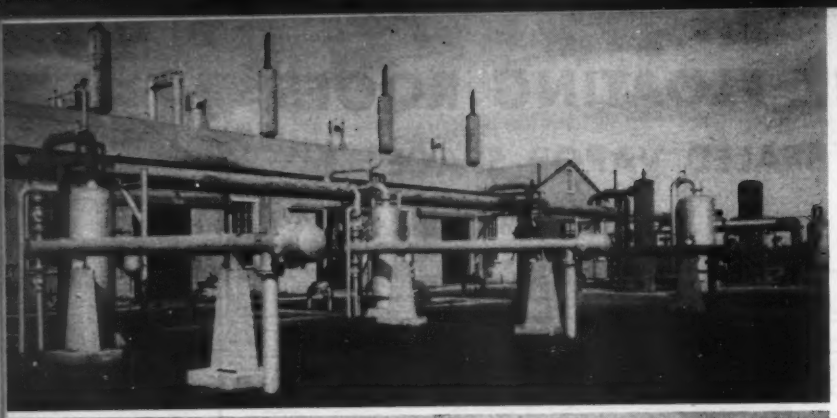


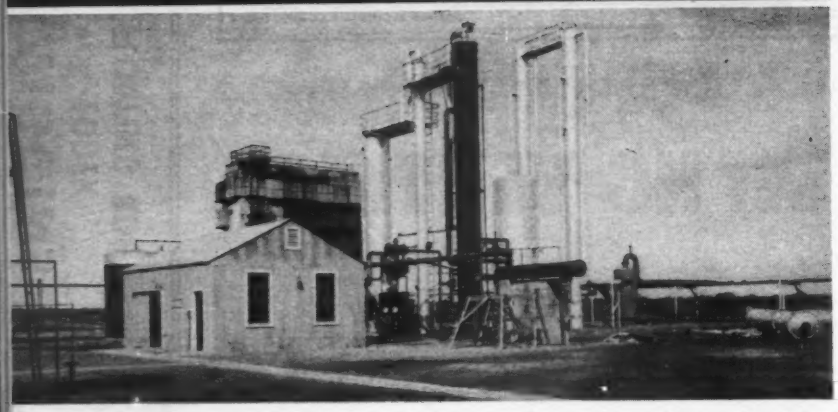


Fig. 3—(Top) Incoming casinghead gas from the four nearby oil fields is passed through these scrubbers before charging to the main bank of compressors. A wide variety of types and makes of equipment went into this plant, illustrating the considerable difficulty of constructing such a project during war and early postwar years. Fig. 4—(Above) The conventional gasoline plant includes two absorbers, still and fractionator. A stabilizer and a deethanizer column will be added to expand plant production to include L.P.G. Long-range plans call for a daily throughput capacity of 50,000,000 cu. ft. of low-pressure casinghead gas

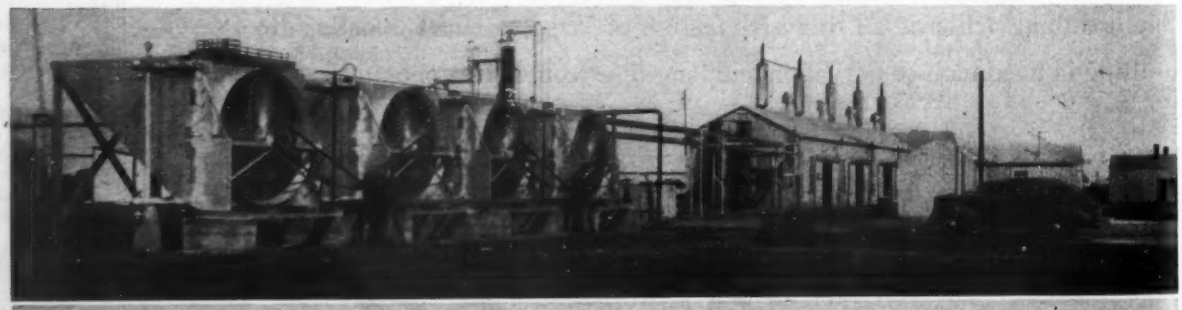
equipment necessary for expansion. From the standpoint of gas supply, it is ideally situated. Within a 6-mile radius of the plant are located over 1,000 producing oil and gas wells in the Hendrick, Kermit, Weiner, Emperor, and Emperor Deep fields. A recent engineering survey of the general area shows a reserve estimated at 300 billion cubic feet of gas, much of it low-pressure casinghead gas, formerly flared.

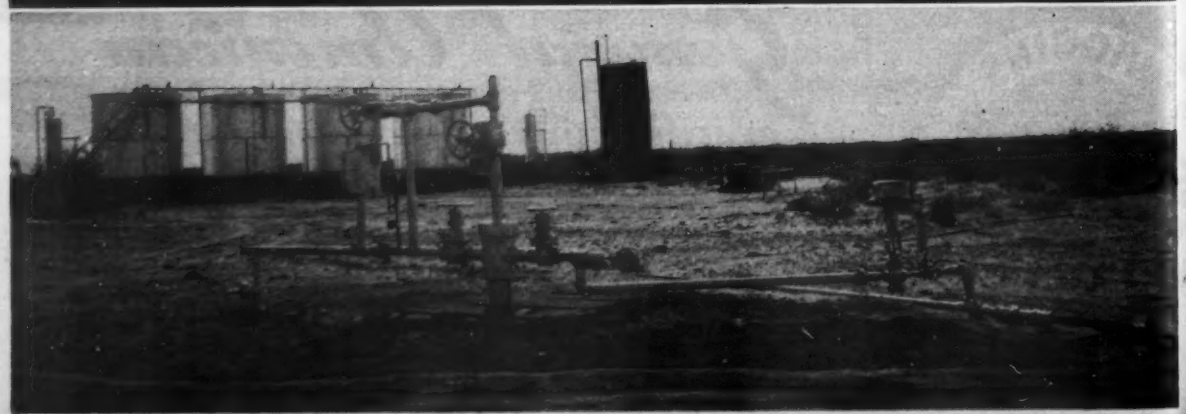
At present the plant is maintaining a daily throughput of about 7,500,000 cu. ft. of casinghead gas from 52 oil wells and about 3,500,000 cu. ft. of gas from gas wells is being compressed for pipe-line and gas-lift use. The conventional gasoline plant incorporates two absorption columns, a heater, still, and fractionator producing at present about 2,500 to 3,000 gal. of 26-70 product daily. A stabilizer and deethanizer, now being installed, will add about 2,500 gal. of L.P.G. to the plant's production.

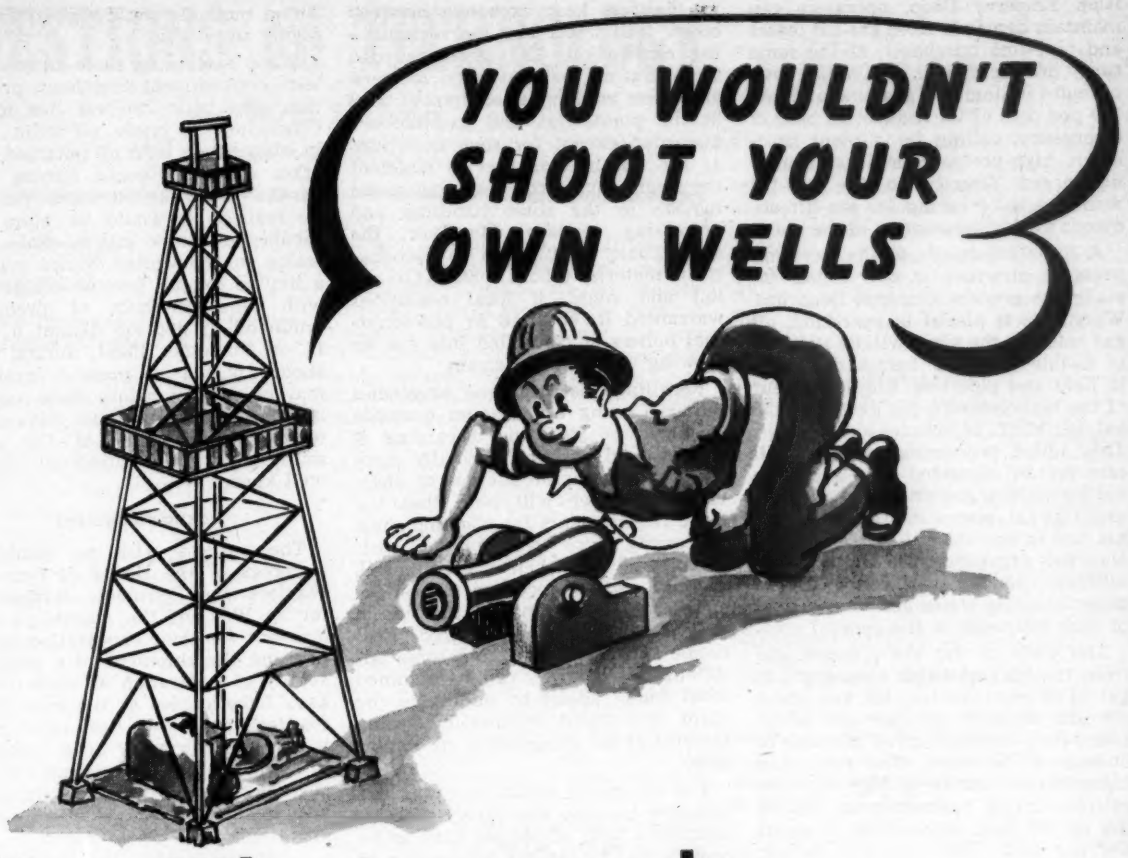
Compressors totaling 1,800 hp. are used to boost the low-pressure lease gas from 10 psi. to the plant operating pressure of 80 psi. Lean gas from the absorbers is recompressed to 450 psi. and charged to the network which supplies gas-lift wells in the nearby fields. Gas at 400 psi. from the Emperor Deep field is compressed to 760 psi. in one compressor for pipe-line purchase. Two additional compressors take 300-psi. gas and discharge to the 450-psi. gas-lift main.

In its present form the plant is very flexible. By using makeup gas

Fig. 5—(Below) Constant jacket-water temperature the year round is provided by these cooling units, driven by steam turbines equipped with thermostat controls. The unusual wedge-shaped baffles blow the air upward at the rear. This prevents the strong West Texas wind from bucking the air flow in summer, causing overheating. The principle is being adopted in other similar installations in the Permian basin. Fig. 6—(Bottom) The plant serves an expanding network of gas-lift lines in nearby fields, utilizing all residue gas from oil leases and in addition, dry gas from Emperor Deep







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from Emperor Deep, operators can maintain demands from gas-lift leases and pipe-line purchaser, at the same time processing all available low-pressure casinghead gas and utilizing 100 per cent of its residue. In case of emergency, calling for a plant shutdown, high-pressure field gas can be discharged directly to the gas-lift main, partially caring for gas-lift demands during inoperation of the plant.

A 10,000,000-cu.-ft., 400-lb. working-pressure absorber is now being installed to process Emperor Deep gas. When this is placed in operation, all gas entering the plant will be stripped of usable fractions before discharge to field and pipe line. Liquid content of the high-pressure gas averages 0.58 gal. per M.c.f., of butanes and heavier. This added processing capacity will care for an expanded pipe-line market for residue gas when El Paso Natural Gas Co. places its Texas-California line in operation. Plans are under way for expanding the plant to an ultimate capacity of 50,000,000 cu. ft. daily, utilizing waste gas from a total of over 250 wells in the general area.

The yield of the low-pressure gas from the various fields averages 1.04 gal. of butanes and heavier, and about 0.8 gal. of 26-70 gasoline per M.c.f. Laboratory analysis shows methane to average 87 per cent. The remaining components include a high fraction of unsaturated hydrocarbons, including an ethylene equivalent of about 6½ per cent. This valuable olefinic fraction is the basis for a detailed chemical research program to be undertaken on completion of a suitable laboratory at the plant. If findings of this study meet present expectations, the plant may form the nucleus of a petrochemical project employing gas conversion to produce acetates, ketones, aldehydes, detergents, and phthalates.

Retorting Oil Shale by Fluidized Solids Method

(Continued from page 88)

ing gas. The retorting products and attendant flue gas are passed through cyclone separators to minimize dust carryover to the recovery system and the oil produced is condensed in one or more steps by direct contact with cooled recirculating oil or water. Such dust as is carried over is collected as a slurry in condensed oil in the first quench tower and returned to the retorting vessel or treated elsewhere for recovery of the oil. Further treatment by steam stripping is applied to the fuel oil, as necessary, for correction of the flash point.

In the design prepared for Australia a high percentage of the sensible heat of the overhead products is recovered by conversion into steam via indirect heat exchange between boiler feed water and the recirculating cooling oil. The steam is used for operating the conveyors, blowers, and other mechanical equipment used at the plant. Gas and gasoline are discarded except for such quantities as are required as fuel to augment the steam supply for operating prime movers in the shale handling and processing sections. Moreover, the spent shale is still rich in carbonaceous material (about 8,000 B.t.u. per lb.) and could, if local conditions warranted it, be fired in powdered-coal boilers or converted into gas by blowing with air and steam.

Recalling that wartime exigencies required using a minimum quantity of fabricated steel and discarding of the gas and gasoline normally associated with the production of shale oil, the reader will note that the basic requirements for wartime shale processing were met. For the post-petroleum era, when maximum oil, gasoline and gas recovery will be desirable, modifications in the design will undoubtedly be required. Economic studies indicate that some additional oil recovery can be obtained from leaner shales by adding to the plant investment without increasing the cost of the incremental oil obtainable.

For an era in which maximum oil recovery becomes mandatory such investments will, of course, have to be considered. As regards application of the fluidized solids technique for retorting, however, the fundamental principles involved will remain unchanged. Most of the increased plant cost will reside in the use of more efficient recovery equipment and in increasing thermal efficiency by utilizing some of the currently discarded potential heat.

Costs.—From the studies made on Australian shale it may be concluded that the fluidized solids technique affords a sound and novel method for retorting oil shales. While shale-oil cost studies have been made it was not felt desirable to include them in this discussion inasmuch as it has been found both by the authors and by other investigators that a major portion of the cost of the final product reflects the price of the raw shale as delivered to the retorting plant. Moreover, for similar reasons it has not been considered advisable to prognosticate costs of refined products when shale oil processing attains commercial importance. Among these are primarily, (1) uncertainty of the relative future demands for various products and (2) uncertainty of the types of refining methods which will be in use if and when shale-oil retorting becomes a "must." Since costs of manufacturing finished products may vary greatly as new refining methods are introduced, predictions of costs on the basis of present refining methods could conceivably be highly unreliable.

When comparing shale-oil retorting with conventional petroleum production, the basic interest lies in the production of crude oil from shale in competition with oil obtained from other sources. Should mining costs of the order of 50 cents per ton be realized it would be quite reasonable to assume that oil-shale processing in the United States may, to a limited extent, become competitive with other methods of producing crude oil at not too distant a date. If, on the other hand, mining costs should persist at present levels, it may be decades before shale processing becomes competitive with crude oils or with many of the other sources of manufactured oil already well known.

Acknowledgment

The authors wish to thank the members of the Board of Economic Warfare, the Petroleum Administrator for War and the Australian Government for their cooperation in expediting the shipment of a generous supply of Australian oil shale to the Esso Laboratories at Bayway, N. J., for test purposes. Acknowledgment is also due the many other members of Standard Oil Development Co. who gave invaluable assistance and guidance in carrying out the experimental operations.

BOOKS

OIL AND GAS FIELD DEVELOPMENT IN UNITED STATES. Year book 1946 (review of 1945) of National Oil Scouts and Landmen's Association, Austin, Tex. Editor-in-chief, W. G. Sinclair; E. J. Raisch, assistant editor. 964 pp. $7.50 to members, $10 to associate members.

This is an annual review of geological and geophysical prospecting, land and leasing activities, proven field development, oil and gas production, pipe-line, and refinery statistics. Statistics are considered by states, or in the case of some states, such as Texas, by sections within states. These state analyses are followed by an article on exploratory drilling in 1945, by Frederic H. Lahee, and by the appendix. This appendix consists of salient annual statistics of the United States, and a roster of active and associate members of the association.

PROCEEDINGS OF THE MEXICAN-AMERICAN CONFERENCE ON INDUSTRIAL RESEARCH. Published by Armour Research Foundation of Illinois Institute of Technology, Chicago. 176 pp. $2.50.

Industrial research in action, from the college laboratory to the extensive applied research programs of industry, is presented in lucid form in this volume. Containing papers by more than a score of the nation's top-ranking scientists, educators, industrialists, and researchers, the book includes the complete proceedings of the week-long Mexican-American conference on industrial research sponsored last fall by the foundation. The book is being offered to the public in the belief that it will prove of value to everyone with an interest in industrial progress through research.

QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

Octane-Number Requirement

What is the octane-number requirement of cars today?—F. E. C.

Controversy continues as to exactly what octane number contributes to road performance or mileage and this argument cannot be properly presented here. There is, however, a reasonably satisfactory answer to the octane number required to suppress knocking. The Refiner's Notebook No. 61 (The Oil and Gas Journal, September 29, 1945) indicates that the percentage of cars that will knock when operating on various octane number fuels is:

Per cent of cars that knock	A.S.T.M. Oct. No.
2	80
8	75
22	70
56	65
81	60
89	55

The experiments (Holaday & Happel, Pet. Eng. Reference Annual, 1943) are somewhat old and hence the following data (Offutt, Ostergaard, Fogle and Beuther, Naphtha Reforming With Outside Gas, twenty-sixth annual meeting of A.P.I., Chicago, November 12, 1946) on late-model cars are presented. Speed is a vital factor. The tests were for a Polyform gasoline that is relatively rich in olefins and aromatic hydrocarbons.

	Approximate percentage of cars that knock		
A.S.T.M. Oct. No.	Approx. 15 m.p.h.	Approx. 40 m.p.h.	Approx. 60 m.p.h.
60	..	80	50
65	80	54	28
70	68	30	8
75	50	10	..
80	25	..	..
85	5	..	..

Vacuum Vessels

Can you direct me to information on the design of vacuum vessels? We plan on using 4-ft.-diameter vessels as accumulators for overhead products.—J. G.

Vessels or tubes exposed to external pressure have not been studied as completely as most situations. External pressure is important in the design of oil-well casing or tubing, steam-jacketed kettles or vessels, and of course, for vacuum towers, condensers, accumulators, etc. If internal braces or posts are employed, the design resolves itself into an analysis of these internal posts by the familiar "column formulas." The use of braces is obviously advisable whenever possible because of the great saving in the thickness of the shell when using internal bracing.

C. A. Andsten in "Strength of Curved Walls Exposed to External Pressure," (Ind. Eng. Chem., Vol. 20, page 364, April 1928) discusses formulas available up to that time for spherical shell and cylindrical shells.

All formulas are to some extent empirical because minor weaknesses within the material, stresses introduced during fabrication, or differences in temperature throughout the shell surface, will initiate collapse. Once bending has started, failure occurs rapidly because the area of surface (or at least the total force) increases forming two or more lobes in which bending occurs.

Raymond J. Roark in his "Formulas for Stress and Strain," (first edition McGraw-Hill Book Co., Inc., New York, 1938) suggests three formulas or conditions (page 274):

Long thin tube.—Very long with free ends:

$$p' = 1/4 \frac{E}{1-v^2} \times \frac{t^3}{r^3}$$

The length should be greater than $4.9r\sqrt{r/t}$.

Short thin tube.—Short tube with ends held circular but not otherwise constrained; or long tube held circular at intervals of l:

$$p' = 0.807 \frac{Et^2}{lr} \sqrt[4]{\left(\frac{1}{1-v^2}\right)^3 \times \frac{t^2}{r^3}}$$

Thin tube, closed ends.—Ends held circular:

$$p' = \frac{E \times t/r}{1 + \frac{1}{2}\left(\frac{\pi r}{nl}\right)^2} \left(\frac{1}{n^2\left[1 + \left(\frac{nl}{\pi r}\right)^2\right]^2} + \frac{n^2t^2}{12r^2(1-v^2)} \left[1 + \left(\frac{\pi r}{nl}\right)^2\right]^2 \right)$$

For a fixed value of t/r determine p' by plotting a series of curves for values of n of 2 and more. That curve which shows the smallest value of p' is used.

Symbols:

p' = external pressure, psi.
E = modulus of elasticity, in.²
v = Poisson's ratio, 0.25-0.3 for steel
t = thickness, in.
r = radius, in.
l = length, in.
n = number of lobes formed in buckling

The most authoritative source is the A.P.I.-A.S.M.E. code which shows a chart (Fig. 27, p. 86) by which allowable pressure, thickness or number of stiffeners can be computed.

E. F. Brummerstedt discusses the application of this chart to the determination of the cheapest vessel as a function of shell thickness and number of stiffeners. (Natl. Pet. News, Sept. 6, 1944).

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Stability of Iodine Solution For Sulfur Determination

We throw away our standard iodine solution used in determining hydrogen sulfide after a few weeks. Is this necessary? What happens to it that makes it go bad?—J. R. C.

Recent quantitative analysis books should be consulted. One of these is Pierce and Haenisch, "Quantitative Analysis," 2nd Ed., John Wiley & Sons.

If reagent grade chemicals are used, if the bottle is kept tightly stoppered from air, and if the solution is kept in the dark by using a dark bottle and by storing the bottle in a desk or closet between tests the solution should keep for several months (E. W. Washburn, Jour. A. C. S., 30, p. 41, 1909). Deterioration of standard solutions of iodine in potassium iodide occurs by oxidation from the air, particularly in the light, and by volatilization of the iodine during exposure. Oxidation produces potassium iodate which reacts differently from iodine, and hence prolonged deterioration will destroy the accuracy of the solution. Nevertheless, it is common practice to restandardize such iodine solution at 2 or 3-week intervals until the solution has been used for 2 or 3 months. Standard sodium thiosulfate may be used. This standardizing solution keeps well if it has been boiled to destroy certain bacteria that cause the liberation of free sulfur in the solution.

3. Equilibrium Factors, Hydrates, and Corrosion

by C. Kenneth Eilerts *

PROBLEMS discussed in previous articles are related primarily to the control of recovery operations in fields to obtain maximum benefits from the reserves of hydrocarbons. Still other problems that depend for their solutions on a knowledge of properties of gas-condensate fluids are but indirectly related to reservoir engineering. Such problems include: (8) The determination of equilibrium factors for use in the design of equipment employed in extracting specific hydrocarbons from gas-condensate fluids; (9) the utilization and the development of data on natural-gas hydrates to facilitate the operation of field collecting systems, gas pipe lines, and drying plants; and (10) control of the internal corrosion of flow strings, christmas-tree fittings, and collecting lines. Such corrosion is known to be serious in many gas-condensate fields.

This is the third of a three-part article. The first part, which appeared February 1, discussed the reserve fluid, its composition and phase behavior. The second part, published last week, had to do with fluid properties and flow relationships in the reservoir.

8. Phase Equilibrium Factors for Gas-Condensate Systems

Equilibrium factors for estimating the distribution of components in the gas and liquid phases of hydrocarbon systems are particularly useful at the pressures normally encountered in separators at the well head and in plants for extracting liquid hydrocarbons from the flowing fluid. It has been found that factors experimentally determined are more reliable for general applications than those computed from the properties of pure components. Results of the investigations of Katz and Hachmuth,[1] published in 1937, of mixtures of natural gas and a crude oil having a gravity of 38.4° A.P.I., provided some of the first of such data available. A set of factors designed for use on absorption problems at cycling plants was obtained by Webber[2] using an absorption oil having a gravity of 32.5° A.P.I. and a prepared mixture of hydrocarbon-gas components. Roland, Smith, and Kaveler[3] determined a set of factors for four gas-condensate mixtures (50, 70, 85, and 90 mol per cent methane) using a 57.5° A.P.I. gravity condensate. The data were obtained at temperatures of 40°, 120° and 200° F. and pressures up to 4,000 psia. Particular attention was given by those investigators to the effect of variations in the composition of the system on values of the factors, and it was their conclusion that, except for the fraction, "heptanes and heavier" variations in composition had little effect on the values of the equilibrium factors for the system studied. The concentration of heptanes and heavier components in the four mixtures varied from 34.3 to 1.2 mol per cent.

It is generally recognized that equilibrium factors for given temperatures and pressures must be selected with consideration for the over-all composition of the system, particularly in the upper range of pressures where values of the factors approach unity. These high pressures are of most concern in gas-condensate reservoir engineering and if equilibrium factors are to be reliable for high pressures, more work on them must be done in the pressure range of fluid dew points.

Some confusion has existed concerning the significance of the convergence point of equilibrium-factor curves. The isotherms of factors for the components of a multicomponent system will converge at unity only if the equilibrium temperature arbitrarily selected also happens to be the critical temperature of the system tested. The changes for such a coincidence are exceedingly remote. The tendency of the factors to converge at the dew point or bubble point of the system will increase as the equilibrium temperature approaches the critical temperature of the system. Limitations in the accuracy of logarithmic plotting and the errors inherent in the experimental methods may prevent accurate indication of actual phase relations at pressures of the phase boundary. At the dew point, the relation between the equilibrium factors of a multicomponent system is satisfied if they provide the equation.[4]

$$\frac{N_1}{K_1} + \frac{N_2}{K_2} + \ldots + \frac{N_n}{K_n} = 1 \quad (2)$$

where, N_1, N_2, ... N_n are the mol fractions of the components in the system and K_1, K_2, ... K_n are the corresponding equilibrium factors. It obviously is not necessary that the equilibrium factors have unit values at dew-point pressures to satisfy the equation.

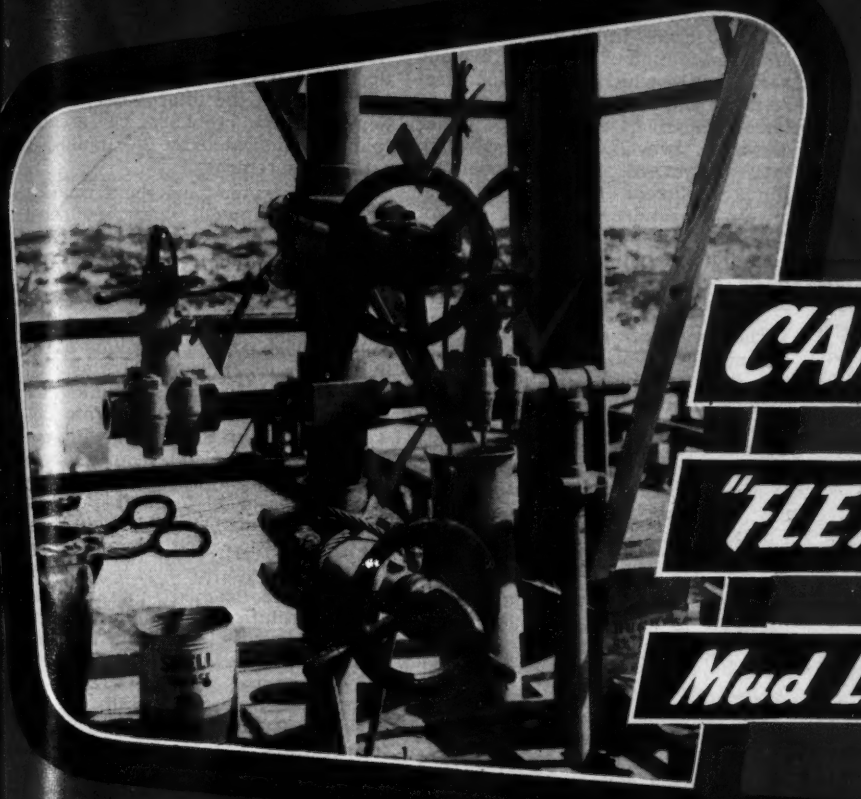
If equilibrium factors are to be useful in gas-condensate reservoir engineering, methods must be developed for adjusting available equilibrium data to suit fluids of particular dew-point characteristics. The inflection and the manner of convergence of the curves of equilibrium factors obtained by Webber[2] and Roland[3] illustrate the complex relations of the factors that prevail at reservoir pressures. Dew points are particularly influenced by the heavy hydrocarbons in the fluid and the mol fractions of these components are the most difficult to determine accurately.

The accumulation of enough liquid phase for analysis from a fluid at pressures just below the dew-point pressure is in itself a problem. Laboratory equilibrium apparatus of practical size will not provide adequate liquid phase at pressures near dew-point pressures for conventional distillation analysis. Mobile equipment like that used by the Bureau of Mines[5] operates on a continuous stream from the flowing well and will provide the necessary volumes of liquid phase at any pressure less than dew-point pressure if enough time is allowed for its accumulation. Samples of liquid to provide the analytical information illustrated in Fig. 2 (see Part 1 of series) were obtained with the Bureau of Mines mobile equipment. Data in Fig. 2 are for the liquid phase only and were not obtained with columns designed for precision analyses, but if similar curves of adequate accuracy were extrapolated to the dew-point pressure, equilibrium factors could be calculated from the relations:

$$K_1 = \frac{N_1}{X_{1d}}, \quad K_2 = \frac{N_2}{X_{2d}}, \quad \ldots \quad K_n = \frac{N_n}{X_{nd}}$$

where X_{1d}, X_{2d}, ... X_{nd} are mol fractions of the components in the liquid phase at the dew-point and N_1, N_2, ... N_n are mol fractions of the components in the flowing fluid as shown in Column 2, Table 1 (see Part 1).

*Senior physical chemist, Bureau of Mines, Bartlesville, Okla. Published by permission of the Director, Bureau of Mines, U. S. Department of the Interior.



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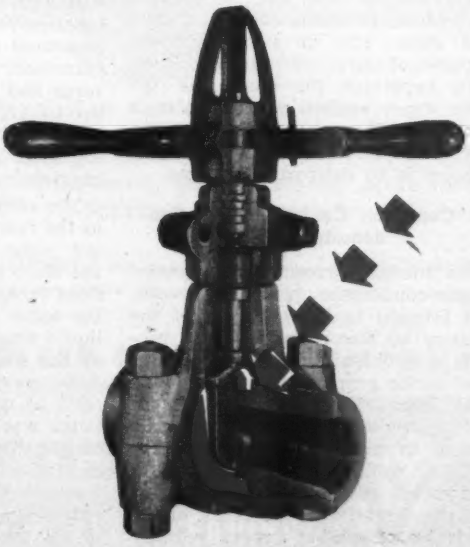

A Cameron "Flex-Seal" in closed position. Note how the gate seats in the resilient flow-way insert (red).

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If equilibrium factors were determined at different temperatures for a number of systems a correlation might be obtained, based on compositions of the systems, that would provide reliable factors for estimating dew points and phase relations at pressures approaching dew points for a wide variety of gas-condensate reservoir fluids.

9. Natural-Gas Hydrates

Recovered gas-condensate fluids usually contain water in amounts which indicate that the fluids were in phase equilibrium with interstitial liquid water at the original reservoir pressure and temperature.[7] The water may move through the formation as a vapor phase, but, as the fluid flows up the well and cools, liquid water is condensed. The liquid water may be removed from the fluid stream by means of a separator, but, at a pressure of 1,000 psia. and a temperature of 70° F. for example, the hydrocarbon gas will still contain 24 lb. of water vapor per million cubic feet of gas. This water vapor can combine with hydrocarbon components of the gas to form hydrates that will freeze at temperatures well above the freezing point of water. The solid hydrates in the moving gas stream often collect at constrictions or at points along pipe lines and impede the flow of gas. Increase in gas pressure as a result of the partial or total stoppage of flow raises the melting point of the hydrate mass and makes it all the more difficult to remove or dislodge.

Hammerschmidt[8] in 1934 published the first results of investigation of the pressure-temperature-water vapor content factors relating to the freezing of natural gas hydrates. Wilcox, Carson, and Katz[9] contributed hydrate equilibrium data on natural gases. Deaton and Frost[10] summarized the published data on this subject and the results of their investigations of the hydrate characteristics of 12 natural gases and of two-component mixtures of pure hydrocarbons. Dewpoint apparatus for measuring the water vapor content of gases also is described. They conclude that the only sure measure for preventing freezing is to dehydrate the gas.

10. Corrosion Control in Gas-Condensate Wells

The internal corrosion of equipment in gas-condensate producing wells, first brought to the attention of the industry by Bacon and Brown,[11] presents a problem that is closely related to the properties of the flowing fluid. Menaul[12] found fatty acids, including acetic and propionic acid, present in the water from gas-condensate wells were corrosion of equipment was noted and suggested that the corrosion is the result of the formation of soluble ferrous salts by the action of the acids on exposed steel surfaces. Rogers[13] and Jessen[14] have shown that carbon dioxide in gas-condensate fluids may form an aqueous solution of corrosive carbonic acid, H_2CO_3, which will attack steel surfaces and convert iron to soluble ferrous bicarbonate, $Fe(HCO_3)_2$. Other corrosive substances, undiscovered, may be present in gas-condensate fluids. A current opinion is that most or all gas-condensate fluids contain some corrosive components but that some fluids do not damage well equipment because they contain also a naturally occurring inhibitor.

The occurrence of the liquid phase of water in the stream of fluid entering the well bore, flowing to the surface through tubing or casing, and passing through christmas-tree fittings to collecting lines on the surface of the ground has bearing on the probable location of the corrosive attack. Pressure and temperature control the capacity of a hydrocarbon vapor phase to carry water, and, if the pressures and temperatures along the flow stream are known, it is possible to use phase-equilibrium data to determine the presence and estimate the volume of liquid water moving with the fluid.

The equipment and the method used by the Bureau of Mines for measuring the liquid-gas ratios of water flowing with hydrocarbon gas in the tubing of a well have been described.[15] Mobile equipment was used at a flowing well from which a fluid sample was drawn continuously for testing in a portable accumulator. The test accumulator and its accessories functioned like the separator and stock tanks at wells. The sample of fluid withdrawn from the well was not accurate as to water content, and water was injected into the sample stream at such rate that the liquid-gas ratio of water collected at atmospheric pressure and temperature with the portable equipment was identical with the corresponding ratio measured at the stock tanks. The accumulator then was operated at pressures and temperatures prevailing in the tubing at different depths to determine the liquid-gas ratio of flowing water in the tubing at corresponding depths.

The results of the test showed that, as the reservoir fluid entered the tubing, some of the water vapor with the fluid was condensed, and, as the fluid temperature decreased, more of the water with the fluid moved as a liquid phase until the liquid-gas ratio at the well head was 0.020 gal. per 1,000 cu. ft. of gas. The liquid-gas ratio of water collected in the stock tanks was 0.021 gal. per 1,000 cu. ft. of gas. The relation between liquid-gas ratios of flowing water and depth was substantially linear, but it does not follow that the liquid-gas ratio of all the liquid water and hydrocarbon gas in, for example, a foot of tubing at a given depth was equal to the liquid-gas ratio of the flowing liquid water and hydrocarbon gas at that depth. Liquid water tends to flow up this well as a film along the tubing wall, and the total water at any depth would probably be greater than was indicated by the liquid-gas ratio measurements.

If liquid water from the formation flows into a well, water collected at the well head usually will contain appreciable concentrations of dissolved solids, particularly sodium chloride. If water from the formation does not enter the well as liquid, the 100 to 300 p.p.m. of dissolved solids in the water collected at the well head probably can be accounted for by entrained solids blown into the well bore and up the tubing with gas. Dust-size solids could be carried in the gas moving upward in the tubing at velocities of 10 to 20 ft. per second and ultimately be dissolved in the liquid water that condenses out of the gas.

Experience gained in injecting aqueous solutions of inhibitors into wells[7] indicates that fluid entering wells from reservoirs in which there has been some decline of pressure may be undersaturated with respect to water at formation pressures and temperatures. Water does not condense in the flow string from such a fluid until it cools to the dew-point temperature at some level above the producing formation. The fluid entering one well was estimated to have a capacity for absorbing 15 gal. of water per million cubic feet of gas at the pressure and temperature prevailing at the bottom of the tubing under conditions of normal flow. An inhibitor consisting of an aqueous solution of sodium chromate was injected into the casinghead of this well to flow down the annular space between the casing and the tubing by gravity and combine with the flowing fluid at the tubing inlet. Unless 15 to 20 gal. of the inhibitor solution was injected for each million cubic feet of gas produced, the solution was evaporated and sodium chromate accumulating in the lowest 100 ft. of tubing formed an obstruction to flow of fluid. If the solution were injected at a constant but low rate, the deposit of sodium chromate increased until flow from the well eventually was decreased enough so that the volume of aqueous solution injected would more than saturate the gas flowing. For satisfactory operation, enough water had to be provided to saturate the gas entering the tubing and yet retain the injected sodium chromate in solution.

Future Problems

Technologic advances, changes in the political economy of the country, and judicial opinions will affect in some measure the approach to future

engineering problems relating to gas-condensate fluids. On the technologic side, the discovery of new uses for natural gas undoubtedly will intensify the demand for more reliable information on reservoir fluids and methods for their recovery. The withdrawal of fluids from reservoirs under territorial waters and possible future development of the Continental shelf will call for more than developing equipment for drilling wells from structures in offshore water as deep as 100 fathoms. Drilling to deeper reservoirs than have been reached, where pressures and temperatures likely will be higher than any now recorded and where the fluids therein likely will be found to have characteristic properties which may be different from those at lesser depths, is certain to introduce new recovery difficulties calling for the application of new techniques. It may one day be desirable to maintain reservoir pressures or displace reservoir fluids with water or with gases other than natural gas.[16]

Acknowledgments

The studies of gas-condensate systems, the results of which are the basis for this report, have been carried on for a number of years in cooperation with the American Gas Association. The valuable assistance given by E. L. Rawlins, chairman of gas-well deliveries subcommittee of the Natural Gas Department, is gratefully acknowledged. Acknowledgement is due R. V. Smith, C. V. Mooney, and Jack Wright of the Bureau of Mines for assistance in securing the plotted data on cores presented in Fig. 3 of this paper and to Betty Hinman who assisted with the calculations. Helpful criticisms were received from Dr. Holbrook G. Botset of University of Pittsburgh, whose published data were drawn upon for use in this paper. H. C. Miller and N. A. C. Smith of the Bureau of Mines have offered valuable suggestions for preparing the manuscript. The figures were drawn by Helen Orr and M. D. Headley. The investigations which have provided the basis for concepts that have been presented are under the supervision of R. A. Cattell, chief, Petroleum and Natural Gas Division, Bureau of Mines, and H. C. Fowler, supervising engineer, and C. J. Wilhelm, engineer in charge of production, Petroleum Experiment Station, Bartlesville, Okla.

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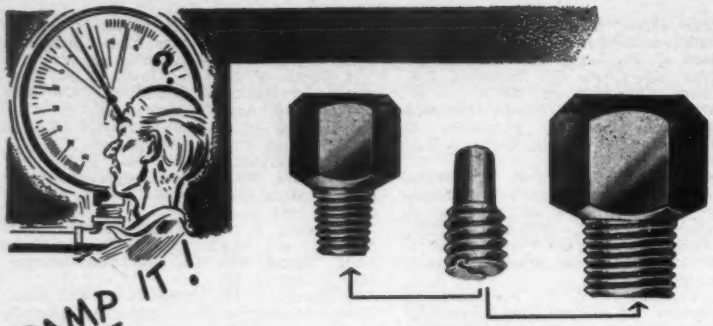

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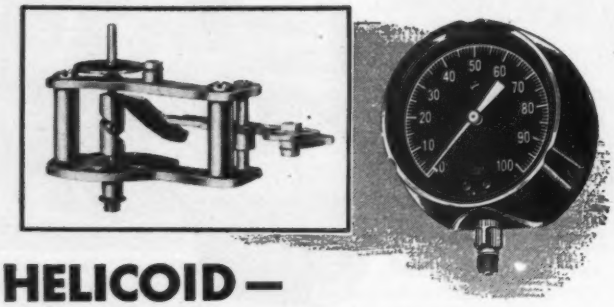

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Location and Spacing of Wells for R-1 Reservoir

(Continued from page 83)

wells, P_w is the operating bottom-hole injection pressure, P is the reservoir pressure, $(P_w - P)$ is the injection buildup, and d is the average distance between a row of injection wells and the first row of producing wells. The product μb is taken at unity and is not included in Equation 3.

Let the injection wells have an 8-in. diameter. Relative to 60 10-acre producing wells, the value of log 2d/r for the injection wells is 4.59. The thickness of the section into which water can be injected averages 60 ft. Relative to no water encroachment, the required rate of water injection is 15,760 bbl. per day. Upon substituting these values in Equation 3, we have

$$n = \frac{K(P_w - P)}{615} \qquad (4)$$

By Equation 2, the reservoir pressure P is as follows:

$$P = \frac{14{,}200}{204K} + P_b \qquad (5)$$

Upon eliminating reservoir pressure between Equations 4 and 5, we have

$$n = \frac{615}{K(P_w - P_b) - 69.6} \qquad (6)$$

where K is the average permeability in darcys for the reservoir injection-well system.

The data in Table 13-2 are solutions of Equation 6. The number of injection wells required in order to inject at the rate of 15,760 bbl. per day ranges from 7 up to 60, depending on permeability, bottom-hole injection pressure and bottom-hole producing pressure. The rate of oil production is 14,200 bbl. per day from 60, or more, producing wells. The data are aside from reduction of permeability by plugging of injection wells.

It will be noted that more than 60 injection wells would not maintain a 14,200-bbl.-per-day oil-producing rate when the bottom-hole producing pressure is too high for a given bottom-hole injection pressure. Under certain pressure conditions, the drilling of additional producing and injection wells will not maintain a desired rate of oil production. In order to maintain oil-producing rates, the injection pressure has to be increased if the bottom-hole producing pressure cannot be decreased. For instance, a change from flowing to pumping may be more economical than pressuring injected water. Some wells usually have to be pumped before abandonment anyhow because wells cutting more than 10 per cent usually cannot flow their production.

The optimum locations for producing and injection wells on the R-1 reservoir are shown in Fig. 13-7. Sixty 10-acre locations are within the 140-ft. contour. The crestal wells are bottomed 140 ft. above water. The wells nearest to the 140-ft. contour are bottomed about 90 ft. above water.

Twelve injection wells are shown along the water contact. The uniform distances between injection wells are based on the assumption that the pay thickness and permeability are uniform. If the latter were not uniform injection wells would not be spaced uniformly. Twelve wells are ample for the R-1 reservoir from the viewpoint of maintaining uniform rates of interface advancement. However, from the viewpoint of injection capacity, more than 12 wells could be required.

TABLE 13-2 — NUMBER OF INJECTION WELLS FOR THE R-1 RESERVOIR

Millidarcys	100	200	400	600	800
Bottom-hole producing pressure, psia.	Injection wells for P_w = 2,000 psia.				
1,200	60	7	..	..	..
1,400	..	12	..	..	..
1,600	..	60	7	..	..
1,800	..	..	60	12	7
	Injection wells for P_w = 2,400 psia.				
1,200	12	..	..	..	..
1,400	20	..	..	..	..
1,600	60	..	..	..	..
1,800	..	12	..	..	..
2,000	..	60	7	..	..

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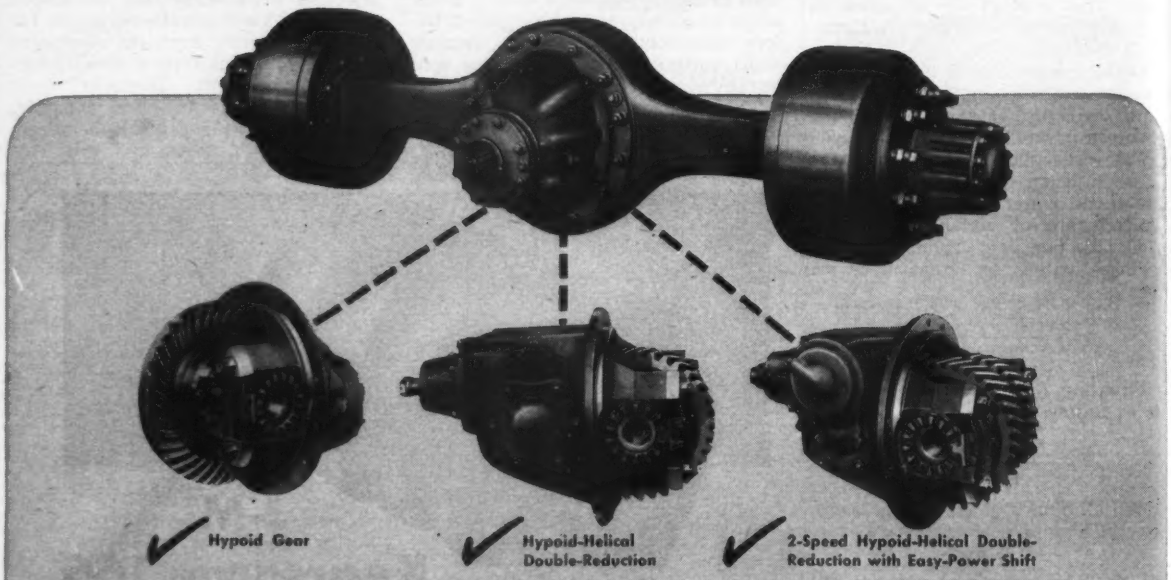

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Location Layout for Power Rig

A STANDARDIZED location layout for a power rig is shown in Fig. 4. The size of the rig has, of course, an effect on the dimensions and distances involved. The layout does show, however, a compact arrangement of the location, particularly of the pit system, resulting in considerable saving of space.

Erection of Derrick

Operation of erecting the derrick, performed by rig-building contractors, or by special crews, is of relatively little concern of the operator and the drilling contractor and will not be considered here. Discussion of the derrick itself will be the subject of the following installment.

Connecting Up

For the purposes of these series the term rigging up was used to include operations other than actual connecting and setting up of the rig. In the field practice these are the operations which are referred to as rigging up.

Some 15 or 20 years ago connecting up of a rig was, in a majority of cases, a project in itself. Measuring, cutting, and threading of large quantities of pipe, making up of innumerable connections, and considerable welding were operations required at each new location. Arranging of heavy equipment required considerable improvisation. Under present conditions and with the size of a modern rotary rig such a method of approach would not be feasible and the picture has changed completely. With unitized equipment and standardized layouts the setting up of a rig is a routine operation. With crews well trained and familiar with the arrangement the operation proceeds rapidly and efficiently.

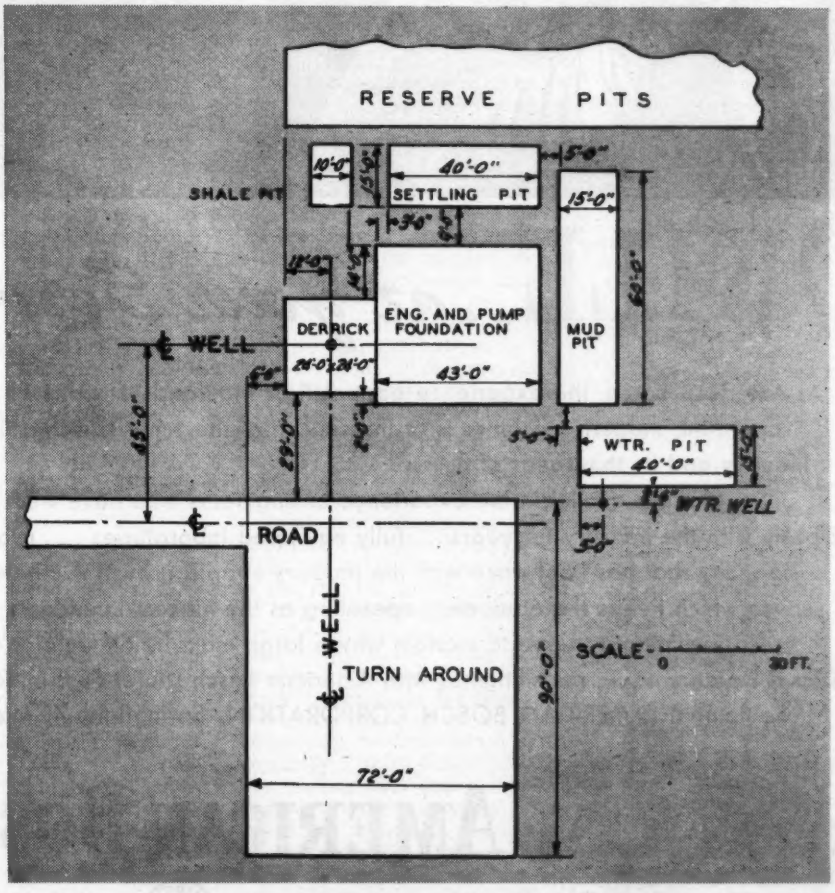

Fig. 4—Standard location layout for a power rig

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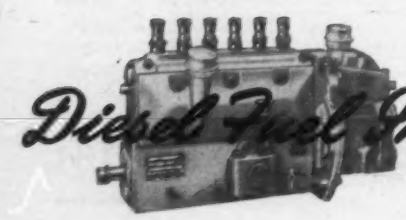

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Firing Oil

TENTATIVE SCHEDULE OF TOPICS

- No. 126—A.P.I. Gravity, 50°-100°
- No. 127—Fuel-Oil Properties
- No. 128—Pipe-Still Outlet Temperature
- No. 129—Equipment Heat Losses
- No. 130—Viscosity, High Range
- No. 131—Firing Oil
- No. 132—Transfer-Line Pressure Drop
- No. 133—Sulfuric Acid Solutions
- No. 134—Transfer-Line Vaporization
- No. 135—Stack Draft

OIL burners used in refineries are mainly of the steam atomizing type. These are of two main designs:

1. **Outside-mix** burners by which the oil is released into a high-velocity sheet of steam. Oil and steam issue from burner through separate openings. Much of the energy in the steam is wasted and steam consumption is relatively high.

2. **Inside-mix** burners are most widely used. In these the steam and oil are mixed in a chamber within the burner and they issue together from burner as a single stream. Foam formed in mixing chamber is directed by shape and direction of burner tip so that the flame is of proper shape and size for the furnace box. As foam issues from the tip, it bursts into a fine mist of oil particles.

Oil fuels.—Residual fuels have better atomizing or foaming properties. Gas oils or distillate fuels do not atomize easily unless they are mixed with residual fuels but naphthas can be burned satisfactorily if a suitable burner tip is employed. Air atomizing burners using low-pressure compressed air are sometimes used for asphaltic residues, acid sludge mixtures, or dirty residues. Acid sludge tends to cause corrosion in steam atomizing burners and hence high-pressure spray nozzles are sometimes employed. Excessive mineral matter causes deposits of glazed solids on heating surfaces.

Firing temperature. — The more viscous fuels should be heated to such a temperature that the Saybolt Universal viscosity is 130-250. A tabulation of preheating temperature versus Furol viscosity was published in The Refiner's Notebook No. 127 (Jan. 18, 1947). The higher the temperature the better the performance unless vaporization occurs or unless water content of the fuel is high. At temperatures past the flash point, operation may be erratic and the flame may splutter. Highly superheated steam may cause excessive coking within burner tip if oil temperature is high. About 0.1 sq. ft. of heating surface (steam coils) is required for each barrel of insulated fuel-oil storage. Heating coils for uninsulated tanks were discussed completely in The Refiner's Notebook No. 12 (Oct. 7, 1944, p. 103).

Pressure and steam. — Rotary pumps are preferable because of the steady pressure they produce. The pulsation in oil pressure and "breathing" of the burners, caused by reciprocating pumps, can be eliminated by an air surge chamber at the pump but air should be added to chamber with each work shift. Although the fuel may be fed by gravity at a head of only 10-15 ft., a pressure of 40-60 psig. is often employed. To obtain satisfactory atomization of light gas oil a pressure of 125 psig. may be required. The amount of atomizing steam for inside mix burners ranges from 0.2 to 0.5 lb. per pound oil (1.6-4 lb. steam per gal.) and may reach 10 lb. per gal. for outside mix burners. In general the higher the pressure and temperature of the oil, the lower the steam consumption. Moisture in the steam causes spluttering or sparks in the flame and if excessive may put out the flame. Steam may be superheated at the burner by a short length of steam line leading into and out of the furnace. In the customary oil recirculation system the amount of circulation is 1.5-2.0 times as much as the oil burned. The oil circulation lines should be insulated and a pair of strainers must be used when handling residual fuels. Pressure gages on each side of the strainers will indicate when a strainer has become plugged. Lines should be flushed out when changing from a residual to a distillate type fuel.

Robert Reed in The Oil and Gas Journal of March 11, 1943, p. 39-45, analyzes oil burner troubles much as follows:

Sputtery or sparky flame.—This in general may be caused by (1) wet steam, (2) suspended solids in the oil, (3) improper design of burner tips for the oil and the duty handled or, (4) foreign matter inside the burner or in the tip.

Long smoky flame.—(1) Improper design of burner-tip, (2) insufficient air for combustion or (3) insufficient atomizing steam.

Failure of ignition—(1) Too much steam for atomization, (2) fuel pressure is low, (3) fuel valve plugged, (4) improper design of tip or too small an included angle on the flame, or (5) wet steam or slugs of water from the steam line.

Excess air.—With care, amount of excess air can be as low as that used for gas burners. Thus, the amount of excess air may be less than 40 per cent although the average throughout the country may now be higher. A dazzling white flame indicates too much excess air. A properly operated oil burner produces perfectly stable yellow-white flame. A fluttery flame indicates that too much atomizing steam is being used. Puffing in the furnace may be caused by poor tip design, insufficient excess air, or partial stoppage of burner tip.

Other Refiner's Notebooks which pertain to fuel oils and their combustion are:

No. 100, Viscosity Blending Chart (July 6, 1946).
No. 105, Fuel-Combustion Characteristics (Aug. 10, 1946).
No. 107, Pipe Still Combustion Charts (Aug. 24, 1946).
No. 113, Heat Balance of Pipe Stills (Oct. 5, 1946).
No. 114, Equivalent Heating Value (Oct. 12, 1946).
No. 127, Fuel-Oil Properties (Jan. 18, 1947).

No. 131 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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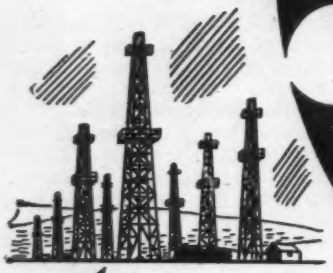

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ENGINEERING *fundamentals*

Formation of Boiler Scale

THE formation of scale and sludge deposits on boiler heating surfaces is the most serious water problem encountered in steam generation. The object of the majority of the external treatment processes is to remove from the boiler feed water those objectionable substances which will contribute to scale or deposit formations in the boiler. However, no system of external softening, regardless of a high degree of efficiency, is in itself adequate protection against boiler scale without the use of supplementary internal chemical treatment of the boiler water.

Mechanism of Scale Formation

The primary cause of scale formation is the fact that the solubilities of the scale-forming salts decrease with increase in temperature. Consequently, the higher the temperature (and pressure) of boiler operation, the more insoluble become the incrusting calcium and magnesium salts.

The actual mechanism of scale deposition can be viewed as taking place in two distinct operations. First, the precipitation from solution of a salt and the sedimentation of this already-formed precipitate on the boiler heating surfaces where it bakes in place as scale. Scale formation due to this mechanism takes place particularly in fire-tube boilers and where the boiler feed water is high in hardness content. However, only a minor portion of scale formation develops in this manner.

The chief mechanism of scale formation is due to crystallization of scale-forming salts from a solution locally supersaturated. The thin viscous film of boiler water immediately adjacent to the heating surface tends to become more concentrated than the main body of boiler water. Crystallization of scale results directly on the heating surface even when the solubility of the scale-forming salts has not been exceeded in the boiler water proper.

Effect of Boiler Scale

Boiler scale creates a problem in boiler operation because the different types of scale formed all possess a low degree of heat conductivity. The presence of scale is therefore equivalent to spreading a thin film of insulation across the path of heat travel from the furnace gases to the boiler water. The presence of this heat insulating material will retard heat transfer and cause a loss in boiler efficiency. Even more important than the effect of scale in causing heat loss, however, is the effect of scale in causing overheating of the boiler metal and consequent tube failures. The scale coating retards the flow of heat from the furnace gases into the boiler water. This heat resistance results in a rapid rise in metal temperature to the point at which failure results.

Mud, Silt, Etc.

The use of turbid river waters as makeup to boiler systems is undesirable from several standpoints, among which is the formation of boiler scale and sludge deposits.

Removal of such suspended solids is necessary prior to the use of the water for boiler feed-water purposes. No internal chemical treatment of the boiler water is designed to overcome difficulties due to suspended solids in the make-up water. The removal of these impurities by external treatment processes is required.

Calcium and Magnesium Salts

Perhaps one of the most common sources of scale is the breakdown of calcium bicarbonate to form calcium carbonate under the influence of heat. The precipitation from solution of calcium carbonate to form boiler scale readily takes place where the boiler feed water contains any appreciable quantity of calcium bicarbonate.

Calcium sulfate is a more soluble salt than calcium carbonate and is generally found only in boilers that have not received any internal chemical treatment or have received only an inadequate quantity of internal treatment. The presence of calcium sulfate in a boiler scale can usually be taken as definite evidence that internal chemical treatment has been used only to an inadequate extent, possibly due to a flaw in the system of chemical control. All methods of internal chemical treatment rely on precipitating the calcium salts in some form other than calcium sulfate.

The use of sodium carbonate (soda ash) was one of the first materials employed to prevent calcium sulfate scale formation. However, calcium carbonate in itself can form a hard adherent deposit and is frequently found as a constituent of boiler scale.

Calcium phosphate and calcium silicate are frequently deposited as boiler scale. Calcium silicate may be formed either from the combination of the calcium and silicate ions naturally present in the boiler feed water or as a result of the misguided use of sodium silicate as internal chemical treatment. Calcium phosphate, on the other hand, is invariably the result of treatment of the boiler water by the use of the various phosphate salts commonly employed.

Magnesium salts present in the boiler feed water are usually more easily prevented from forming scale than are the calcium salts. Usually, the magnesium salts found incorporated in boiler scale are magnesium hydroxide, magnesium silicate, or magnesium phosphate.

Silica

Another source of concern is the tendency of silica to form scales of a complex nature, which may or may not include calcium and magnesium in their structure. Formation of such complex deposits usually occurs in boilers operating at higher pressures and proper treatment of the boiler feed water requires the maintenance of both silica and aluminum ion concentrations at a minimum.

Oil

The presence of oil in boiler feed water is particularly undesirable. One of the most obvious difficulties resulting from oil contamination is carryover of solids with the steam. However, oil may also contribute greatly to the formation of heat insulating scale deposits.

This material is from the Betz Handbook for Industrial Water Conditioning, written and published by W. H. and L. D. Betz, consulting engineers, Philadelphia.

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Type "BCF"—smaller oil and water coolers.

BULLETIN 3623-A
Type "IS"—instantaneous heaters for water, oils, chemicals.

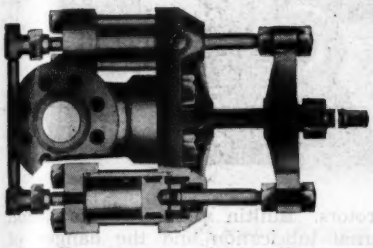
BULLETIN 3624-A
Type "O"—oil preheaters
Type "TS"—tank suction heaters for heavy fluids.

BULLETIN 5222
Type "BCP"—oil and water coolers, marine design.

OIL AND GAS EQUIPMENT Digest

IT'S NEW CHECK IT

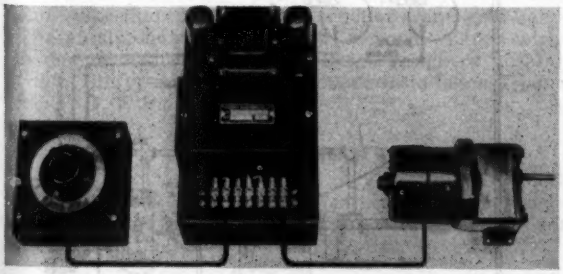
by John M. Spears



(1) HIGH-CLOSING-RATIO VALVE is a pressure-operated flow-line valve that can be closed with a low hydraulic-operating pressure against high well pressure. Closing ratio of well pressure to hydraulic-operating pressure is approximately 8 to 1; opening ratio is approxomately 4 to 1. Pressures acting upon the ram-type gate are equalized when hydraulic pressure applied to operating cylinders is equal to one-fourth of the well pressure. Employs cylindrical ram-type gate and self-feeding packing element. Gate-cavity choke port eliminates high-velocity flow across sealing surfaces between gate and body just before complete closure is effected. *Cameron Iron Works, Inc.*

IT'S NEW CHECK IT

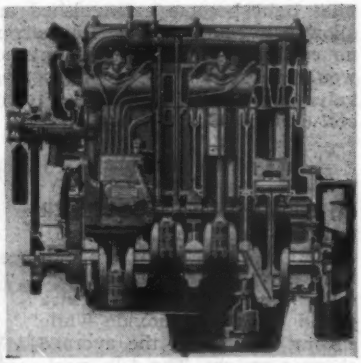
(2) SYNCHRO-LINK REMOTE CONTROL is a remote-positioning servo-control that will quickly and accurately position a distant motor according to the setting of a control transmitter. Unlimited applications include control of speed transmissions, valves, dampers, etc.



Works on principle of a self-balancing electronic bridge. Consists of three basic elements: Master control with knob and calibrated dial for manual control or with ¼-in. shaft extension for automatic control; electronic controller; and load-control potentiometer, geared to the motor or coupled to the load. In operation, turning knob of the master control to a new setting causes an unbalance in bridge circuit. The controller detects the unbalance and closes circuit to motor for rotation in proper direction. As soon as the load and the load-control potentiometer approaches the new balance position, but before actually reaching that position, the controller cuts off full power to the motor and sends only short pulses of current until motor, advancing slowly in small increments, reaches the precise balance position at which point control action ceases and motor stops. *Yardeny Laboratories, Inc.*

IT'S NEW CHECK IT

(3) DIESEL POWER UNIT. Sectional view shows heavy-duty 76-hp., 4-cylinder UD-14A diesel engine. A new cylinder-head arrangement, improved nozzles, and redesigned precombustion chambers give higher compression and greater efficiency in converting fuel energy into low-cost power. View illustrates replaceable cylinders, full-floating piston pins, electrically hardened crankshaft, precision-type bearings, gear-type pump supplying oil under full pressure through drilled passages to all wearing parts, and thermostatically controlled bypass-type cooling. Gaskets are Thiokol coated to prevent drying and to increase sealing efficiency. *International Harvester Co.*



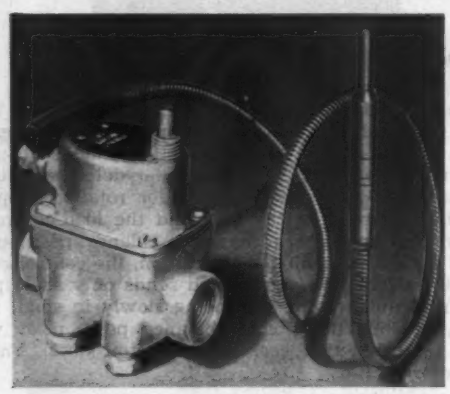
IT'S NEW CHECK IT

(4) NEW MR-2 THERMOVALVE is designed to provide automatic safety-pilot control of fuel to main burner of a gas-fired appliance. Valve is of the manual-reset type,

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

Keep Informed. Save Time. Tear Out Card. Check It. Mail It.

and a position-indicator flag gives visual check as to whether the valve seat is open or closed. In operation, a single thermocouple is heated by pilot flame and produces a small electrical current, which energizes the electromagnet in thermovalve. Magnet is not capable



of actuating valve to open position but will hold armature in contact with it once it has been moved there manually. This is done by pressing reset button. Should pilot light become extinguished and the thermocouple allowed to cool, the electrical current would cease. With no current flowing through magnet coil the armature would be released, allowing spring to close the main valve shutting off flow of gas to the main burner *General Controls Co.*

IT'S NEW CHECK IT

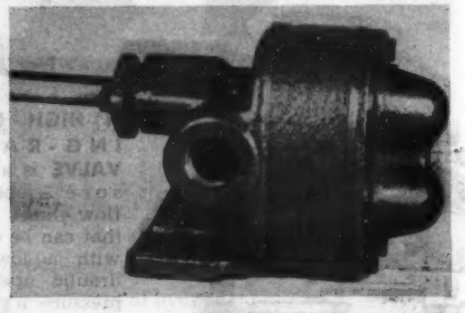
(5) NEW FIRE EXTINGUISHER contains fire-killing carbon dioxide in a light-weight cylinder. New portable replaces the old 4-lb. type, giving an extra pound of carbon dioxide while cutting 2½ lb. off the average charged weight. The 4-lb. portable weighed 18 lb.; whereas the new 5-pounder weighs but 15½ lb. Increased carbon dioxide content provides added protection. Easier handling has been made possible by reduction in weight. *Walter Kidde & Co.*

IT'S NEW CHECK IT

(6) PRESS-FORMED CENTRIFUGAL PUMP combines attractive appearance with new construction features. Pump body is press formed of Armco-ingot iron which is resistant to corrosion. New design weights up to 90 lb. less than former cast-iron design. Press-formed pump body resists cracking or shattering under heavy blows—or in freezing weather. Pumping efficiency is improved by smooth surface of pump and press-formed volute, which results in smoother flow because of reduced friction. Fast self priming. *Chain Belt Co.*

IT'S NEW CHECK IT

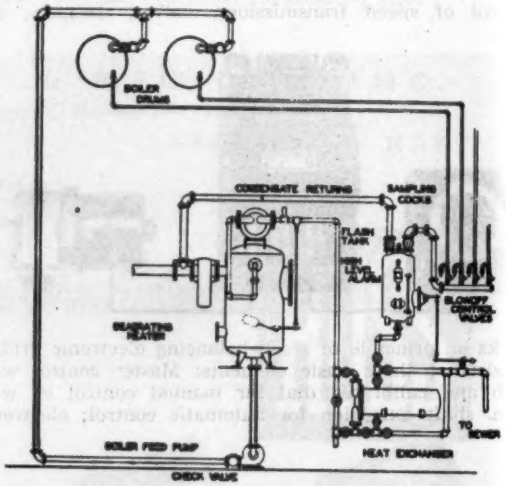
(7) GA ROTARY PUMPS are designed for durability under severe service requirements in pilot plants, barrel house and blending, lubricating oil reclaiming plants, etc. Features include four-bearing construction and spe-



cial herringbone rotors. Builtin pressure lubrication eliminates all external lubrication and the danger of liquid contamination. Models are available in capacities up to 51 g.p.m. and 100 psi., and in foot or flange mountings with adjustable stuffing box and mechanical seal. May be equipped with oversize unloader-type relief valve. *Worthington Pump & Machinery Corp.*

IT'S NEW CHECK IT

(8) CONTINUOUS-BLOWOFF SYSTEM recovers heat which would ordinarily be lost when boilers are blown directly to the sewer. System employs the "flash" principle, which recovers heat in two stages: (1) By the utilization of steam flashed from the blowoff; (2) by directing the hot waste water remaining after flash through a heat exchanger. With this method of operation, the concentrated boiler water is introduced into a

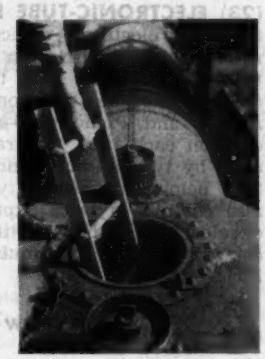


tank operating at any desired pressure. Because blowoff water is at a temperature corresponding to pressure at which boilers are operating, a reduction in pressures causes "flashing" and steam is generated at lower pressure. This steam can be utilized to heat feedwater in an open or deaerating heater or can be condensed in a closed heater or flash condenser, imparting heat to water at a point beyond the deaerating heater. The un-

flashed water is generally passed through a heat exchanger, the cooling medium being makeup water on its way to boiler. Diagram indicates relation of boiler-room equipment to flash tank and heat exchanger. *Cochrane Corp.*

IT'S NEW CHECK IT

(9) NEW ALUMINUM LADDER for tank car, tank farm, refinery, gasoline plant, and various lease uses offers numerous advantages over wood construction. Aluminum construction and weight of only 1 lb. per foot makes it lighter, stronger, and more durable. Can be used safely around inflammable liquids and gases as it is fireproof and nonsparking. Outside width is 12 in. Available in any length up to 16 ft. *W. E. Brosius Co.*

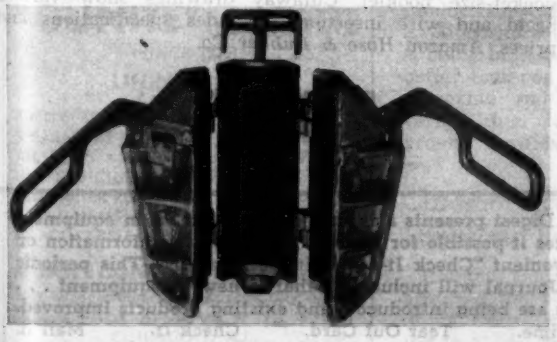


IT'S NEW CHECK IT

(10) CASING SEAL BUSHINGS are used as hydrostatic seals between line pipe and casing in highway and right-of-way crossings. A "T" - type synthetic-rubber gasket electrically insulates pipe from casing (of particular value in cathodic - protection installations), and in addition provides a hydrosatic seal between pipe and casing. Bushings are also used as vibration dampeners and hydrostatic seals between pipe and wall sleeves installed in concrete walls of pump and compressor rooms, pipe-line manifolds and junctions, and gate-valve and regulator boxes. This permits removal of pipe without damage to concrete walls. Hinge design of bushing permits full opening which facilitates installation around pipe. *T. D. Williamson, Inc.*

IT'S NEW CHECK IT

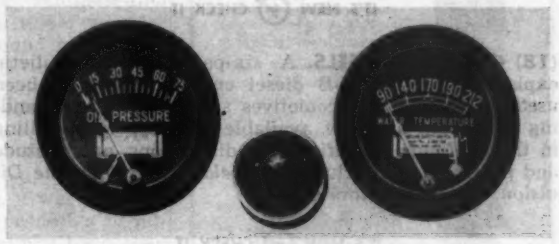
(11) TYPE A ROTARY SLIPS feature lighter weight and higher strength in the popular three-piece liner



type. Lighter weight is achieved with no sacrifice of strength or rigidity through use of a new body design and higher-strength heat-treated alloy steel. Extra rigidity is achieved by providing 30 per cent greater bearing area between slip and rotary bowl. Construction assures easier handling and longer lasting. *Texas Iron Works.*

IT'S NEW CHECK IT

(12) TRUCK SAFETY SWITCHES prevent engine damage caused by failure of cooling system or oil pressure. Switch is used in conjunction with either oil-pressure or water-temperature gages on oil-field trucks, bull-



dozers, etc. An adjustable silver-contact switch automatically closes an electrical circuit when pressure or temperature goes below predetermined limits. Wiring may be arranged to ground ignition circuit or activate warning light or buzzer. Switch is mounted visibly in side of gage or at rear of instrument. *Frank W. Murphy, Mfr.*

IT'S NEW CHECK IT

TRADE LITERATURE

(13) STEAM CONDENSERS. Multi-colored catalog describes and illustrates new types and sizes of surface condensers; also gives formulas, graphs, pressure-temperature conversion tables, and a table of logarithms to the base C. *C. H. Wheeler Manufacturing Co.*

IT'S NEW CHECK IT

(14) FLEXITALLIC GASKETS. Bulletin describes principles of gasket design which brings a new degree of closure safety for pipe flanges and pressure vessels—for any pressure or temperature consistent with code requirements. Two color, illustrated. *Flexitallic Gasket Co.*

IT'S NEW CHECK IT

(15) OIL-BATH ROTARY. A 20½-in. oil-bath rotary equipped with tachometer and sprocket is described and illustrated in four-page bulletin. Features a three-way locking device which provides flexibility of control over drilling conditions with a saving of drilling time. Contains specifications and detailed outline drawing for unit installation. *Oil Well Supply Co.*

IT'S NEW CHECK IT

(16) SC BALL BEARINGS. A two-color bulletin gives pertinent engineering information covering pillow blocks, hanger bearings, flanged units, takeup units, cylindrical units as well as steel-frame ball-bearing takeups. Selection tables provide a convenient means of selecting right bearing for any application within size and load range of the line. *Dodge Manufacturing Corp.*

IT'S NEW CHECK IT

(17) ORGANIC NITROGEN COMPOUNDS. New 31-page booklet presents in detail the properties, specifications, and uses of the alkyl amines, alkylene amines, alkanolamines, and acetoacetarylamides. In chart form it gives their physical constants, comparative hygroscopicities, and neutralization curves. These compounds are used for emulsifying, neutralizing, synthesizing, dissolving, and saponifying. *Carbide & Carbon Chemicals Corp.*

IT'S NEW CHECK IT

(18) OIL-FIELD DIESELS. A six-page fold-out bulletin explains Model 8-567-B diesel engine which has been used extensively in locomotives and in Navy tank-landing ships and are now available for deep-well drilling in the oil fields. Specifications, dimensions, and altitude and power curves included. *Cleveland Diesel Engine Division, General Motors Corp.*

IT'S NEW CHECK IT

(19) HEAT ENCLOSURES. A 29-page condensed catalog treats many problems involved in burning fuels within heat enclosures and describes solutions developed in bricking in boilers and furnaces. Liberally illustrated with plant photographs and color sketches. *Geo. P. Reintjes Co.*

IT'S NEW CHECK IT

(20) OIL FILTERS. Booklet describes and illustrates oil filters which give continuous maintenance for all fuels, lubricants, hydraulic oils, and coolants. Explains how filter works, and gives specifications and dimensions for each model. Pages tabbed for easy reference. *The Briggs Filtration Co.*

IT'S NEW CHECK IT

(21) CHEMICAL PUMPS. New 30-page 4-color catalog presents recommended applications for controlled volume, chemical, and high-pressure pumps; automatic volume control; capacity selection tables; and tables of available materials of construction for each of 200 chemicals. Latter tables particularly applicable to engineers. Loose-leaf bound. *Milton Roy Co.*

IT'S NEW CHECK IT

(22) SELF-ALIGNING COUPLINGS. New 57-page, loose-leaf catalog covers not only the basic principle of how to avoid bending stresses in shafting and excessive pressures on bearings, but also shows the different types of couplings and recommended uses. A three-color cross section, engineering drawings, and ratings included. *Koppers Company, Inc.*

IT'S NEW CHECK IT

(23) ELECTRONIC-TUBE DATA BOOK. Replacement tubes for electronic devices may be quickly and accurately selected with help of new "Easy Guide to Electronic Tube Data." Lists tubes according to "family" or class—Phototubes, Pliotrons, Thyratrons, Ignitrons, Kenatrons, and Planotrons—and gives essential technical data on each tube. Separate index is arranged numerically by type number, and tells the class to which each tube belongs, its warranty class, and list price. Booklet also contains a brief explanation of the five functions of electronic tubes—rectifying, amplifying, generating, controlling, and phototube applications. *Westinghouse Electric Corp.*

IT'S NEW CHECK IT

(24) WELL PRODUCTIVITY. In fourth-quarter issue of company's periodical appears a technical discussion entitled "The Effect of Gun-Perforating Density on Well Productivity." Article reviews factors and results that have been attained in the development of means for determining efficient gun-perforating plans for well completion. *Lane-Wells Co.*

IT'S NEW CHECK IT

(25) SYNTHETIC RUBBER INSULATIONS. A 12-page report contains manufacturer's answer to controversial question, "Which is better—natural or synthetic rubber?" Includes comparative tables of synthetic and natural rubber in performance grade, ozone resistant, heat resistant, and low water-absorption insulation. Also compares jacket compounds. *Simplex Wire & Cable Co.*

IT'S NEW CHECK IT

(26) DIESEL TRACTOR. New 30-page catalog completely describes diesel D-7 Tractor used in oil-field and pipe-line work. Booklet covers each unit—from engine to track and roller frame assembly. Cutaway drawings and flow diagram illustrate operation of engine and other parts. *Caterpillar Tractor Co.*

IT'S NEW CHECK IT

(27) HOSE AND COUPLINGS. Hose for air, steam, and all liquids are illustrated and described in 20-page pocket-size booklet. Cutaway drawings show various braid and wire insertions. Includes specifications and prices. *Amazon Hose & Rubber Co.*

IT'S NEW CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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REFINING

Krug's Report Outlines Synthetic-Fuel Progress

WASHINGTON.—Gasoline may be produced from coal or natural gas at a cost of 7½ to 9½ cents per gallon, not including profit or interest on investment, U. S. Bureau of Mines engineers have found, according to the report recently made by Interior Secretary Krug to Congress. These costs are arrived at as a result of research of the bureau into the field of synthetic fuels. Reports say that this type of fuel has been produced in Europe, especially Germany at a cost much higher than is indicated in this country. Such costs can be excused only in the face of Europe's lack of petroleum and the exigencies of war.

The report reiterates the claim that crude-oil production from existing fields "cannot be increased substantially without irretrievable loss," and that "for several years discoveries of oil in new fields have not kept pace with consumption." The secretary reported that construction has been completed practically at three of the four major bureau installations for further investigation of synthetic-fuel production. The units include those at Pittsburgh and Bruceton, Pa., where coal gasification and development of methods via the Fischer-Tropsch reaction for synthetic-fuel production have been under way for some years. Underground gasification of coal is being experimented with at Gorgas, Ala., where with Alabama Power Co. a test is being made at one of the company's mines. Russia, a pioneer in this work, plans to produce 920,000,000 cu. ft. of fuel gas annually by 1950, it was stated.

Fundamental data on design of oil-shale and pilot-plant units have been worked out. A thermal-solution process is being developed for oil-shale recovery which has shown more shale oil obtained than the shale assay has indicated. The oil-shale demonstration plant at Rifle, Colo., near the original site of oil-shale studies in the 1920s, is practically completed and expects to start operation early in 1947. Core drilling has shown that 15,000,000,000 bbl. of shale oil are available in Naval Oil Shale Reserve 1 alone, considerably more than had been estimated previously, an amount equal to about three-fourths of the estimated petroleum oil reserves of the United States. Two shale mines have been opened to supply the demonstration plant, and to determine mining costs of commercial scale. In the latter diesel trucks and electric shovels will be taken underground, and the costs are expected to be about 50 cents per ton of shale.

At Louisiana, Mo., a coal-liquefaction plant will be built from a government-owned ammonia plant, to produce up to 200 bbl. per day of oil. At Morgantown, W. Va., a laboratory is being built to develop cheaper and better methods for producing carbon monoxide and hydrogen from pulverized fuel (coal) and by underground gasification of coal.

Calumet Acquires Louisiana Refinery

Calumet Refining Co., Chicago, has acquired the assets of Princeton Refining Corp., Princeton, La., according to C. A. Harris, Calumet general manager.

Major improvements and repairs

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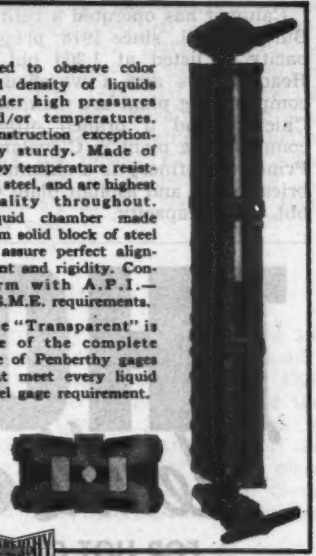
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Effective and practical alkylation catalyst for production of high octane motor fuels.
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Also finding use as condensation reagent. Of increasing interest in polymerization, isomerization and acylation reactions.
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Write for helpful booklet, "How to Handle Anhydrous Hydrofluoric Acid Safely."
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are now in progress preparatory to resuming operations early in February. Further changes and modernization by the installation of additional facilities will be continued this year. This plant, like the one in Burnham, will specialize in producing lubricating oil from selected crudes.

Calumet has operated a refinery at Burnham, Ill., since 1918; present capacity is listed at 1,200 bbl. daily. Headquarters and a warehouse and compounding plant are maintained in Chicago, and a branch office and compounding plant in Cleveland. The Princeton refinery is a skimming, lubricating-oil and asphalt plant of 630-bbl. daily capacity.

California Mineral Spirits Company Organized

American Mineral Spirits Co., Western, with home offices in Los Angeles has been organized under the joint ownership of American Mineral Spirits Co. and Richfield Oil Corp.

Products marketed by Amsco Western will be manufactured in the Watson, Calif., refinery of Richfield. California crude and catalytic-cracked base stock will be processed into petroleum naphthas of both the aliphatic and aromatic types and into various boiling ranges and evaporation rates required commercially.

American Mineral Spirits has specialized in the manufacture and marketing of petroleum solvents or technical naphthas in the area east of the Rocky Mountains.

Max A. Williams, vice president of American Mineral Spirits Co., is president of American Mineral Spirits, Western. David E. Day, vice president in charge of manufacturing for Richfield Oil, is executive vice president, and A. J. Falkenberg, formerly of American Mineral Spirits' Chicago office, is secretary and treasurer.

Consumption of Synthetic, Natural Rubber Shows Gain

NEW YORK.—Consumption of crude rubber, both natural and synthetic, totaled 941,322 tons during the first 11 months of 1946, an increase of 28 per cent over consumption of 734,712 tons during the same period in 1945.

Use of natural rubber increased 145.53 per cent to a total of 238,768 tons in the first 11 months of 1946, while use of manufactured rubber increased 10.21 per cent with a total consumption of 702,554 tons. Consumption of reclaimed rubber totaled 252,076 tons, an increase of 13.83 per cent over 1945.

W. S. Richardson, president of B. F. Goodrich Chemical Co., largest U. S. producer of manufactured rubber, last week predicted 450,000 long tons of synthetic rubber will be needed by the nation in 1947.

The nation, he said, "still is largely dependent upon American rubber." The chemical company operates Government GR-S rubber plants at Borger and Port Neches, Tex., and recently purchased the plant in Louisville, Ky., for manufacture of its own chemically synthesized products.

Rohm & Haas Plans New Chemical Products Plant

Construction is scheduled to get under way soon on a new chemical products plant for Rohm & Haas Co. on the Houston Ship Channel, Deer Park, Tex. The company, which operates plants at Bristol and Philadelphia, Pa., and at Knoxville, Tenn., late last year bought a 500-acre site on which the new plant will be built.

Shell Scientist to Speak

Dr. Monroe E. Spaght, vice president of Shell Development Co., will address the American section of the Society of Chemical Industry at 8 p.m. February 20 on "Future Research in Hydrocarbons." The meeting will be held in the Executive club rooms of the International Business Machines Corp. Building in New York.

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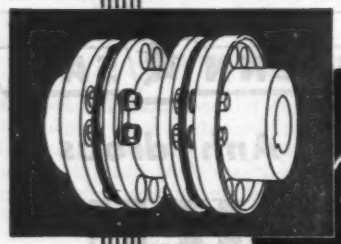

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NO LUBRICATION IS REQUIRED!

The Thomas All-Metal Coupling does not depend on springs, gears, rubber or grids to drive. All power is transmitted by direct pull.

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NATURAL GAS

New Facilities Proposed By Michigan Consolidated

WASHINGTON.—The Federal Power Commission has received an application from Michigan Consolidated Gas Co., Detroit, for authority to install additional facilities in the Austin and Reed City gas fields near Big Rapids, Mich. Construction cost is estimated at $1,572,450.

The application was filed pursuant to an FPC order of November 30, which authorized Michigan-Wisconsin Pipe Line Co. to construct a gas-transmission pipe line from Hugoton field in Texas and Oklahoma to various markets, including several operating districts of Michigan Consolidated in Michigan. Upon completion of its pipe line, Michigan-Wisconsin proposes to lease and subsequently purchase the Austin and Reed City fields from Michigan Consolidated and operate them as gas-storage fields as integral parts of the proposed pipe-line project. Pending completion of the line, Michigan Consolidated will continue to operate the two fields.

Mississippi River Fuel Rate Hearing Set

WASHINGTON.—The Federal Power Commission was scheduled to open a rehearing February 12 in Washington on a proposed conditional-rate schedule filed by Mississippi River Fuel Corp. in connection with FPC orders of November 9 and 30, 1945, directing the company to reduce rates by $945,613 annually on the basis of 1943 revenues.

The revised schedules were filed by Mississippi River Fuel last August and met the requirements of the commission's rate-reduction order in so far as the level of rates was concerned. The company, FPC said, sought by a reservation in the schedules to preserve a right to collect retroactively the rates which the commission found to be unreasonable and unlawful in its orders of November 9 and 30, 1945, if such orders were not sustained upon court appeal. The reservation was rejected by the commission.

Carthage Allowable Revised

AUSTIN.—In an amendment to a previous order, the Texas Railroad Commission has set the daily gas allowable for February at 377,757,678 cu. ft. for Carthage field of East Texas.

Application to Amend 7-Cent Gas Order Denied

OKLAHOMA CITY.—The Oklahoma Corporation Commission has denied an application of Phillips Petroleum Co. to vacate or amend the commission's new price-fixing order on natural gas taken from the Guymon-Hugoton field in Texas County. The order fixed the price of gas at 7 cents per 1,000 cu. ft. at the well head. Cities Service Gas Co. is appealing the order.

Contract Awarded for L.P.G. Standby Facilities in Detroit

CLEVELAND, Ohio.—A further increase in standby facilities for the storage and use of liquefied petroleum gas is in prospect for Detroit with the announcement by Stacey-Dresser Engineering, Cleveland, a division of Stacey Brothers Gas Construction Co., that it has been awarded a contract by Michigan-Consolidated Gas Co. to handle engineering and erection details of the new installation.

The original plant built last year by Stacey-Dresser provided Detroit with an additional 20,000,000 cu. ft. of gas per day during the recent cold spell. The new facilities, to cost more than $1,000,000, will add 30,000,000 or 40,000,000 cu. ft. per day.

When completed, the installations together will consist of 96 tanks of 30,000-gal. capacity and constitute the world's largest storage plant for liquefied petroleum gas serving the gas industry, according to E. A. Flaschar, general manager of Stacey-Dresser Engineering.

December Natural-Gas Sales Up 6.5 Per Cent

December sales of natural gas were 6.5 per cent higher than in December 1945, and the sales index stood at 183 per cent of the 1935-1939 average for the month, according to the American Gas Association.

Degree days in the natural-gas territories for December were 21 per cent under a year ago and were 11 per cent under the 1935-1939 average. For the 12 months ended December 31, 1946, sales of natural gas were 0.1 per cent higher than sales in the like months of 1945.

Total sales of all types of utility gas to ultimate consumers, excluding sales to other utilities, in December 1946 were 7 per cent ahead of a year earlier, the association reported. December was the sixth consecutive month in which gas sales registered a gain over 1945, and the increase was due almost entirely to new customers and to sales other than house heating for former customers since degree days in December were approximately 21 per cent lower than a year ago.

Kansas Group Organizes

Officers of a newly organized association of royalty owners of southwestern Kansas will be elected February at the second meeting of the group in Ulysses, Kans. Formed to "foster and protect and further the rights and interests" of royalty owners in southwestern Kansas, the group held its first meeting recently in Hugoton.

Rate Hearing Delayed

WASHINGTON.—The Federal Power Commission has postponed until February 24 a hearing in Washington in connection with its investigation of Tennessee Gas & Transmission Co.'s rates covering interstate wholesale sales of gas.

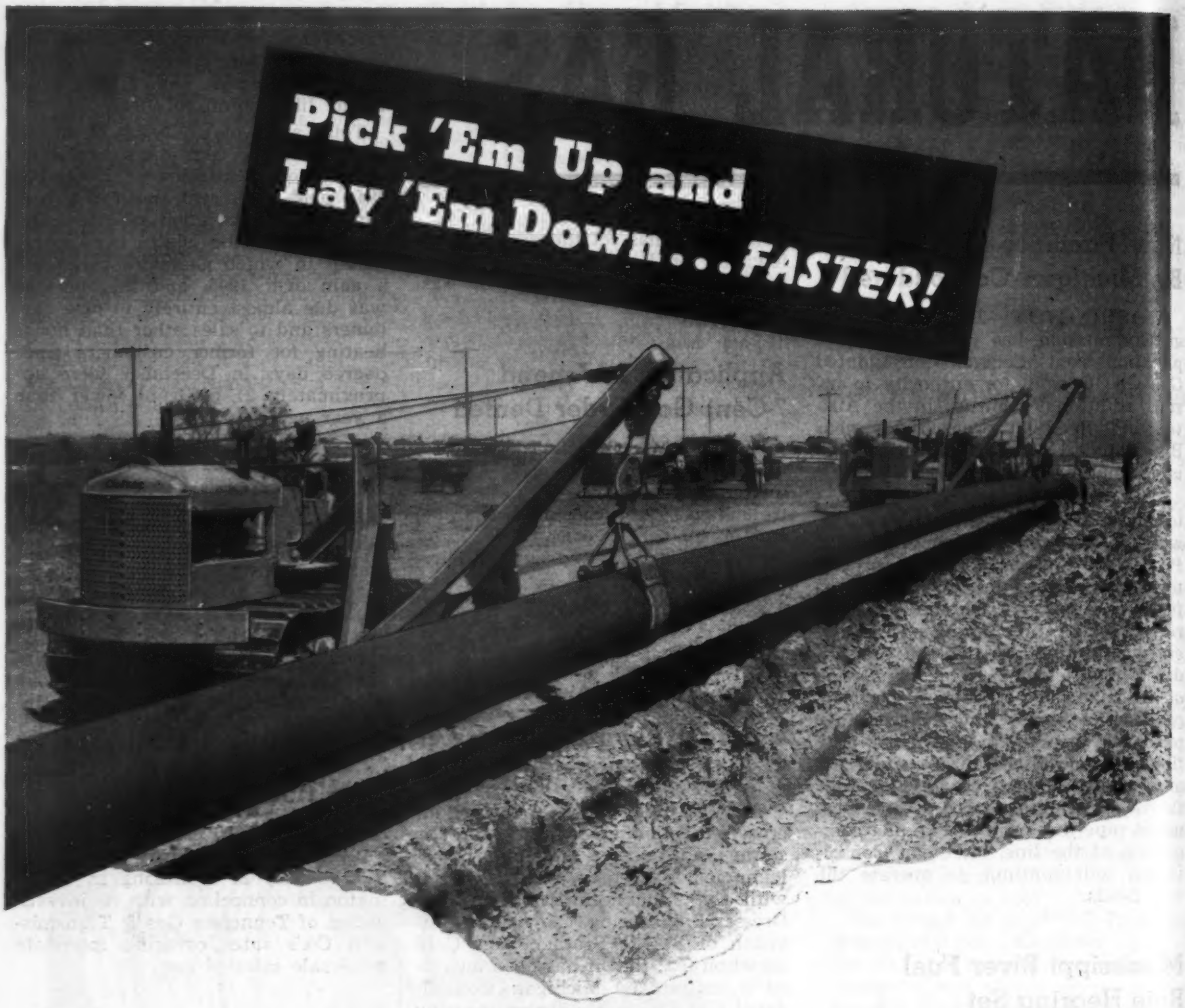
Natural Gasoline

Natural-Gasoline Output Sets Record in November

WASHINGTON.—A record in production of natural gasoline and allied products was set in November with a daily average of 14,007,000 gal., against 13,718,000 gal. in October and 12,928,000 gal. in November 1945.

All states except Illinois, Michigan, and Wyoming showed gains during the month, according to a report of the Bureau of Mines. Production during the first 11 months of 1946 showed a gain over 1945 with a daily average of 13,160,000 gal. against 12,781,000 gal.

In the Mid-Continent area, December production of natural gasoline averaged 4,323,353 gal. daily, according to a report by the Natural Gasoline Association of America, an increase over November's daily average production of 4,221,159 gal.



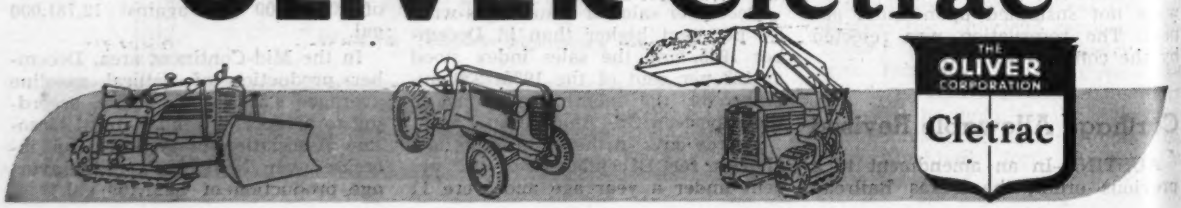
Lifting pipe . . . holding it in position for welding . . . carrying and lowering it into the trench . . . all these essential steps can be speeded through the use of Oliver "Cletrac" crawler tractors.

The exclusive design of Oliver "Cletrac" tractors makes them ideally suited for pipe line work. Tractor frames are designed so that side-mounted equipment, such as side booms, do not impose unequal strains on the frames, gears, or shafting. Loads are balanced to assure greater safety and maximum traction.

Oliver "Cletrac's" patented steering, with power never completely disconnected from either track, offers greater load-handling ability. One track can be speeded up—the other slowed down to compensate for the side drag of a side boom load. The tractor travels a straight line without skidding or sideslipping.

For all the facts on this husky tractor, write The OLIVER Corporation • Industrial Division, 19300 Euclid Avenue, Cleveland 17, Ohio.

OLIVER-Cletrac



PIPE LINES

Oklahoma Natural Gas Co. Contracts Yard Coating

Oklahoma Natural Gas Co. has been coating more than 7 miles of 3 and 4-in. pipe at the company's Tulsa yard which has been contracted by Tulsa Pipe Coating Co., managed by I. L. Brunkow.

This contractor is specializing in coating with yard equipment which is transported in a large trailer from one job to another. This contracting firm will also coat lines for Oklahoma Natural in the field with traveling-type equipment.

Specifications Prepared For Borger-Denver Line

Specifications are being prepared for a 365-mile 6-in. refined-products pipe line from Borger, Tex., to Denver, to be built by Phillips Petroleum Co. and Shamrock Oil & Gas Co.

On completion, it is reported the system will be operated by the Phillips organization. The prospect for obtaining pipe deliveries indicates that specifications will be issued to contractors and bids will be asked within a few weeks.

There will be three stations on the line, located at Borger, Tex.; McKee, Tex., and La Junta, Colo. Each of these stations will be equipped with two Aldridge variable-stroke pumps driven by electric motors.

Memphis Natural Plans 1,000-Mile Gas Pipe Line

WASHINGTON.—Memphis Natural Gas Co. has filed with the Federal Power Commission a request for permission to construct a 24-in. natural-gas pipe line from East Texas gas fields to Pittsburgh.

Work on the 1,000-mile line would not be started until 1949 because of the current shortage of pipe. First section to be laid would be between the East Texas terminus, probably in Carthage field, and Louisville, Ky. The company plans to complete the line within a year.

The line would carry approximately 300,000,000 cu. ft. daily to eastern distribution firms and would cost an estimated $63,000,000.

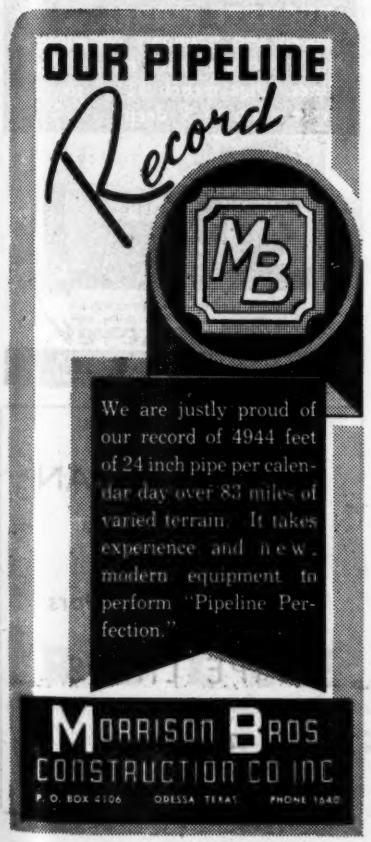
The request said the gas would be delivered to Memphis Light, Gas & Water Division; Louisville Gas & Electric Co.; Kentucky Natural Gas Corp.; East Ohio Gas Co., and Ohio Fuel Gas Co.

Further Testimony Taken In Kansas City Hearing

KANSAS CITY.—Three witnesses for the Northern Natural Gas Co., Omaha, were crossexamined last week in the Federal Power Commission's hearing on applications of three companies to extend and develop their pipe lines.

Herbert Henderson, Cedar Rapids, Iowa, assistant general manager of the Iowa Electric Power & Light Co.; Ed Jones, St. Paul, city engineer, and W. L. Shomaker, superintendent of sales for Northern Natural, were called to amplify previous direct testimony and explain sources and computing methods of figures introduced by the utility.

Northern Natural is seeking permission to enlarge main-line facilities in Kanses, to enter the St. Paul market and to extend service to Marsh-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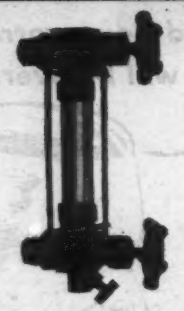

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alltown, Iowa. The other companies seeking to lay pipe lines to transmit Hugoton gas northeastward are: Mid-Continent Gas Transmission Co., St. Paul, and the Cities Service Gas Co., Oklahoma City.

Phillips Reconditions Products Trunk Line

Phillips Petroleum Co. recently commenced reconditioning of 65 miles of 8-in. products line in Kansas. The work is divided between Bishop & Locke Construction Co., operating at the west end, and H. C. Price Co. at the east end. There is no prospect of a Borger-Wichita line mentioned as a construction project of Phillips in previously published reports.

Phillips Petroleum Co. is planning for construction to start this spring for the laying of 35 miles of 6 to 20-in. pipe for natural-gas lines to extend the company's systems in the Eunice, N. M., and Fullerton, Tex., areas. Some consideration is being given to the building of a 289-mile, 12-in. crude-oil line for Standish Pipe Line Co., a Phillips affiliate, when pipe may be procured.

Cosden Builds Terminals To Handle 20-Car Trains

Cosden Petroleum Corp.'s recently constructed terminal at Sweetwater, Tex., received the first 20-car load of gasoline February 9 shipped from the company's refinery at Big Spring, Tex., February 8 in a program to take advantage of the new multiple-car rate which went into effect in January. Property has been acquired; specifications have been issued, and preparations have been made for construction of other terminals to handle train-load shipments of 20 cars or more at Abilene, Cisco, and Orme, Tex., (near Arlington between Dallas and Fort Worth). These terminals will be completed within the next 2 months. During peak periods it is expected that a train a day will leave the Cosden refinery to these points on the Texas & Pacific Railway Co. system.

The new rates for train loads of a minimum of 20 cars effect a reduction of approximately 60 per cent to destinations on T. & P. lines within the state of Texas. For example, the carload rate for the Big Spring-Sweetwater run of 65 miles is 10 cents per hundred weight; the new 20-car rate is 4½ cents per hundred weight. Shipping distances from Big Spring and new rates for trainload shipments to other destinations are as follows: Abilene 106 miles, 6½ cents; Cisco, 153 miles, 8 cents; and Orme, 280 miles, 13 cents.

Train-load rates are to be in effect on an experimental basis for a year; and at the end of this time the status of train-load rates is to be determined by negotiation. These new rates are the first multiple-car rates which have been established for refinery products, according to Douglas Orme, traffic manager of the Cosden company. Approximately 25 years ago there was a multiple-car rate for crude oil which is not now effective. There are multiple-car rates for railroad shipments of molasses, bauxite ore, coal, and gravel. It has been estimated that the new train-load gasoline rates are approximately 20 per cent higher than the expense which shippers incur if they had their own pipe lines for transporting products.

As result of the new multiple-car rates, Cosden Pipe Line Co. has abandoned the planning of its project for a 275-mile products pipe line.

Magnolia Prepares For 650-Mile, 20-In. Line

Magnolia Pipe Line Co. will issue specifications and ask for bids early in March for the construction of a 650-mile 20-in. crude-oil pipe line from Corsicana, Tex., to Patoka, Ill. It is expected that pipe deliveries amounting to 48,000 tons will be made in April and May with other shipments to come later. Right-of-way has been bought along the entire route in Texas. The survey has been completed.

BUCKEYE MODEL 11 for Speed and Economy on gathering, product and natural gas lines. Digs trench 11½" to 22" wide — up to 5' deep.

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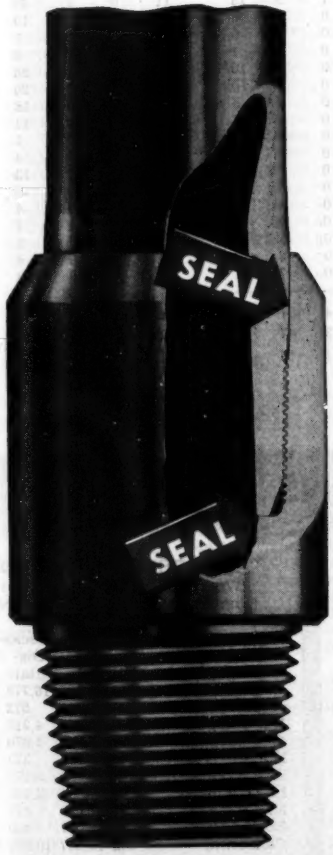

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The Shrink-Grip "Safety Area" and the fixed landing shoulder seal the entire pipe thread length against leakage and corrosion. In addition, the Shrink-Grip "Safety Area" supports the drill pipe against failure at the last engaged thread.

No chasing or re-threading is necessary when you have a replacement job. Nor do you have to send your pipe to a shop and run up your costs. Reed Super Shrink-Grip Tool Joints can be applied or replaced right on your location, anywhere. On that next string of drill pipe specify Reed Super Shrink-Grip Tool Joints for more wells per string with greater safety.

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STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED FEBRUARY 8, 1947

	Total of all wells							Wildcat completions and discoveries									
						Cum.							Cumulative total 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	27	13	0	*14	38,013	166	170	0	0	0	0	0	0	0	0	0	0
Pennsylvania	62	25	3	†33	98,317	373	429	0	0	0	0	0	0	0	0	0	0
West Virginia	17	0	14	3	47,846	88	65	0	0	0	0	0	0	0	0	0	0
Ohio	19	3	9	7	65,259	149	116	0	0	0	0	0	0	0	1	5	6
Indiana	8	6	0	2	14,216	48	35	0	0	0	1	1	1	0	0	3	4
Kentucky	6	1	4	1	11,004	44	53	0	0	0	0	0	0	0	0	6	6
Illinois	25	16	0	9	66,589	212	216	1	0	0	1	2	8	0	0	37	45
Michigan	5	1	0	4	8,562	86	71	0	0	0	3	3	0	0	2	33	35
Kansas	53	27	11	‡15	179,053	297	256	2	0	2	3	7	6	0	3	32	41
Neb., Mo., Iowa	1	0	0	1	1,180	1	1	0	0	0	1	1	0	0	0	1	1
Oklahoma	64	37	6	‡21	223,127	429	284	1	0	1	4	6	9	0	1	68	78
Texas	142	87	8	47	668,268	813	889	4	5	1	32	42	26	5	6	129	166
North Central	40	23	1	16	116,635	252	311	3	0	1	9	13	11	0	2	47	60
West	39	30	0	9	198,473	210	187	0	0	0	8	8	1	0	1	19	21
Panhandle	9	1	7	1	27,072	47	45	0	0	0	0	0	0	0	0	1	1
Eastern	6	4	0	2	31,498	47	81	0	0	0	1	1	1	0	0	8	9
Gulf Coast	26	17	0	9	179,409	182	216	0	5	0	5	10	10	5	2	28	45
Southwest	22	12	0	10	115,181	75	49	1	0	0	9	10	3	0	1	26	30
Louisiana	25	13	1	11	168,510	130	127	1	0	0	4	5	6	3	0	18	27
Northern	8	2	1	5	26,684	58	66	0	0	0	4	4	0	0	0	11	11
Southern	17	11	0	6	141,826	72	61	1	0	0	0	1	6	3	0	7	16
Arkansas	1	1	0	0	7,393	21	17	0	0	0	0	0	0	0	0	4	4
Mississippi	8	3	0	5	65,297	43	28	0	0	0	5	5	0	0	1	13	14
Southeastern States	0	0	0	0	0	5	8	0	0	0	0	0	0	0	0	5	5
Montana	6	0	4	2	9,623	22	30	0	0	0	1	1	0	0	0	4	4
Wyoming	5	2	1	2	21,582	27	19	0	0	0	2	2	2	0	1	7	10
Colorado-Utah	3	2	0	1	18,636	19	12	0	0	0	1	1	0	0	0	3	3
New Mexico	6	3	0	3	30,764	51	51	0	0	0	2	2	1	0	0	6	7
California	34	25	1	8	151,175	215	211	0	0	0	7	7	2	0	0	33	35
Total United States	517	286	62	189	1,894,414	3,239	3,068	9	5	4	67	85	61	8	15	407	491
Total previous week	500	270	64	166	1,726,797	2,722	2,561	15	3	3	47	68	52	3	11	340	406
Total Feb. 9, 1946	507	281	60	166	1,628,853			10	0	1	57	68	41	1	14	366	422

Service wells included: *14, †31, ‡1.

MARKET QUOTATIONS

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Tex.*	West Tex.†
18-18.9	$1.17	....	....	....
19-19.9	1.21	....	....	....
20-20.9	1.24	$1.30	....	$1.17
21-21.9	1.28	1.32	....	1.19
22-22.9	1.32	1.34	....	1.21
23-23.9	1.35	1.36	....	1.23
24-24.9	1.39	1.38	$1.61	1.25
25-25.9	1.43	1.40	1.63	1.27
26-26.9	1.46	1.42	1.65	1.29
27-27.9	1.50	1.44	1.67	1.31
28-28.9	1.54	1.46	1.69	1.33
29-29.9	1.57	1.48	1.71	1.35
30-30.9	1.61	1.50	1.73	1.37
31-31.9	....	1.52	1.75	1.39
32-32.9	....	1.54	1.77	1.41
33-33.9	....	1.56	1.79	1.43
34-34.9	....	1.58	1.81	1.45
35-35.9	....	1.60	1.83	1.47
36-36.9	....	1.62	1.85	1.49
37-37.9	....	1.64	1.87	1.51
38-38.9	....	1.66	1.89	1.53
39-39.9	....	1.68	1.91	1.55
40 and above	....	1.70	1.93	1.57

*For crude from Daboval, El Campo, and Sandy Point. †Includes Lea County, New Mexico.

(Quotations shown here are f.o.b. plant in tank cars and in cents per gal. as of last Monday.

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	7.375-7.625	6.750-7.000
Tex. Gulf Coast	7.50-7.75	6.750-7.125
New York Harbor	9-10.75	8-9.25

*Basic Oklahoma Group 3. †1938 C.F.R. (research method).

NATURAL GASOLINE

Grades—	26-70	18-55
Oklahoma (Group 3)	5.125	6.150
N. Texas (f.o.b. plant)	4.625	5.550
N. Louisiana (f.o.b. plant)	4.875	5.850

CRUDE-OIL PRICES

Representative posted schedules per bbl	
East Texas	$1.70
Kettleman Hills, California*	1.69
Beauregard Parish	1.65
Illinois Basin	1.82
Pecos County, Texas (Yates)	1.40
Bradford, Pennsylvania	3.65
Eastern Ill., and Western Ind.	1.67
Tomball, Texas Gulf Coast	1.85

Note: Crude prices exclusive of subsidy.

A.P.I. REFINERY REPORT

Week ended February 1, 1947
(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Stocks—Distillate	Stocks—Residual
East Coast	713	21,495	16,772	6,868
Appalachian	165	3,593	572	381
Ill., Ind., Ky.	770	19,515	4,218	3,109
Okla., Kan., Mo.	405	9,819	1,870	1,217
Inland Texas	218	4,046	378	756
Tex. Gulf Cst.	1,127	15,829	9,175	6,197
La. Gulf Cst.	361	5,389	3,189	1,741
N. La., Ark.	57	2,029	577	109
Rocky Mtn.	135	2,557	460	576
California	832	16,307	10,920	27,062
Total 2- 1-47	4,783	100,579	48,131	47,947
Total 1-25-47	4,820	99,801	50,357	48,558
Total 2- 2-46	4,501	102,574	28,920	34,485

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
February 1, 1947	223,737,000
January 25, 1947	221,655,000
February 2, 1946	224,351,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Feb. 8 crude oil	B. of M. Feb. demand	Feb. 1 crude oil
Alabama	1,050	1,200	850
Arkansas	80,300	76,000	79,200
California	885,800	838,000	884,000
Colorado	37,650	33,000	37,080
Eastern	68,500	64,200	63,000
Florida	245	200	245
Illinois	197,800	204,000	195,900
Indiana	19,900	18,000	17,600
Kansas	276,500	263,000	284,700
Kentucky	28,400	28,000	27,700
Louisiana	412,100	387,000	415,375
North Louisiana	101,800	.....	101,750
South Louisiana	310,300	.....	313,625
Michigan	42,695	46,000	43,705
Mississippi	90,035	66,000	87,350
Montana	20,710	23,000	21,010
Nebraska	700	800	700
New Mexico	103,400	98,000	103,000
Oklahoma	367,950	370,000	365,150
Texas	2,056,665	2,030,000	1,931,615
District 1 (Southwest)	19,950	.....	19,085
District 2 (Southwest)	146,025	.....	133,110
District 4 (Southwest)	223,250	.....	206,525
District 3 (Gulf Coast)	451,000	.....	412,175
District 5 (Eastern)	36,440	.....	33,700
District 6 (Eastern)	106,100	.....	99,435
East Texas field	328,200	.....	301,000
District 7C (West)	32,665	.....	27,585
District 8 (West)	467,455	.....	464,725
District 7B (W. Central)	36,100	.....	34,000
District 9 (N. Central)	126,355	.....	118,225
District 10 (Panhandle)	83,125	.....	82,050
Wyoming	101,370	93,000	103,040
Miscellaneous	.....	600	.....
Total United States	*4,791,770	4,640,000	4,661,220

Change from prev. week, up 130,550

Total production January 1-February 8..... †183,008,890 bbl.

Same period last year (crude plus condensate).. 187,971,280 bbl.

*Not incl. 26,420 bbl. condensate. †Incl. 993,260 bbl. condensate.

CRUDE-OIL STOCKS 223,737,000 bbl. as of February 1—up 2,082,000 bbl. One year ago 223,303,000 bbl.

GASOLINE STOCKS 100,579,000 bbl. as of February 1—up 778,000 bbl. One year ago 102,574,000 bbl.

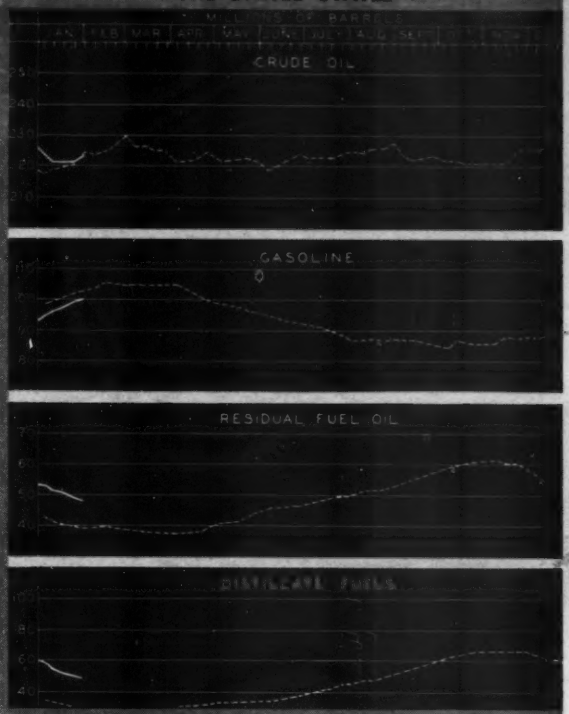
RESIDUAL FUEL-OIL STOCKS 47,947,000 bbl. as of February 1—down 611,000 bbl. One year ago 34,485,000 bbl.

GAS OIL AND DISTILLATE STOCKS 48,131,000 bbl. as of February 1—down 2,226,000 bbl. One year ago 28,920,000 bbl.

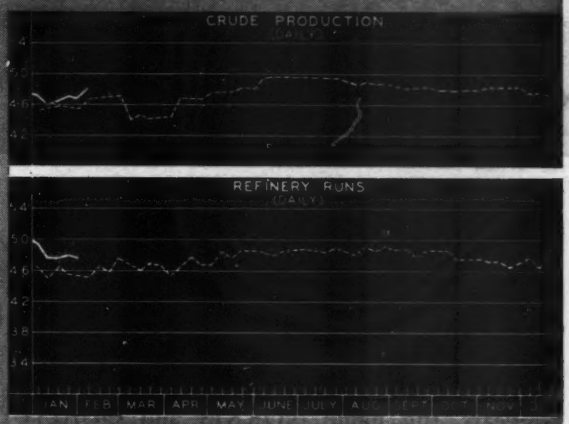
CRUDE-OIL PRODUCTION 4,791,770 bbl. as of February 8—up 130,550 bbl. One year ago 4,683,000 bbl.

REFINERY RUNS 4,783,000 bbl. daily week ended February 1—down 37,000 bbl. One year ago 4,501,000 bbl.

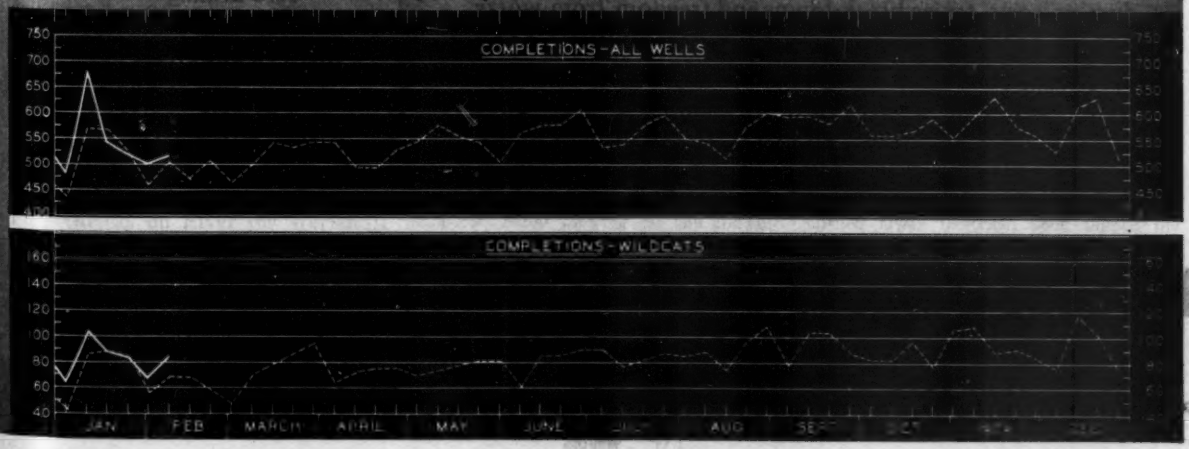
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included.



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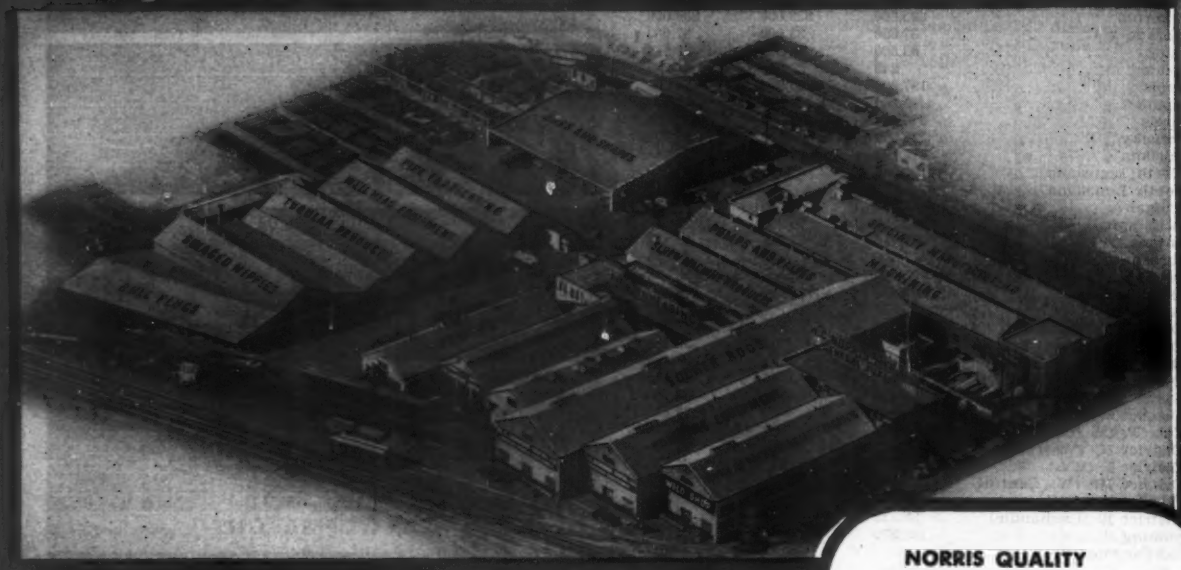

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Exploration and Drilling

Rocky Mountain Inter-Basin Test

by Charles J. Deegan

THE third successful strike in the inner-basin play in the Rocky Mountains was assured when C. & G. Oil Co. 1 Government, NE. NW 19-45n-92w, on Neiber Dome, Washakie County, Wyoming, whipped the problem of frozen tubing, plugged by expanding gas, and flowed 34 bbl. per hour of 42° oil through open tubing, with 1,300,000 cu. ft. of gas from the Embar, perforations at 10,025-55 and 10,070-95 ft.

The plugging up of the tubing by freezing resulting from expanding gas, which plagued this well, as it did the Pure Oil Co. strike on the Worland (or River) Dome, 18 miles north, was solved by a new technique. A 5-in. liner was run to 3,000 ft., between the tubing and the 7-in. producing string. Then hot oil was circulated in the annulus between tubing and 5-in.

This test was drilled to a total depth of 10,990 ft., topping Embar at 10,025 ft., Tensleep at 10,270 ft., Amsden at 10,437 ft., and Madison at 10,736 ft. Both Tensleep and Madison were reported tight and hard. It was then plugged back to 10,189 ft., and perforated, six holes to the foot at the present producing intervals, 10,025-55 ft., and 10,070-95 ft. It flowed at the rate of about 6 bbl. per hour for 4 or 5 hours, but gradually froze up and plugged the tubing. The hot oil circulation appears to have turned the trick, since the present rate of flow is five to six times that reported before.

This is the third success in the inner-basin play that has been going on in Wyoming, and the second in the Big Horn basin. The first, also in the Big Horn basin, was that of Pure Oil Co. on River (or Worland) Dome some 18 miles north of the present structure. The second was Rocky Mountain Fuel Supply Co. 1 Unit, in 8-16n-112w, Uinta County, in the southwest corner of the state.

Some idea of the difference between testing rim structures and shooting for the deeper inner basin structures may be gained from a recent strike in the Embar on a rim structure, not far from Pure's River Dome inner-basin success. In a distance of 12 miles from a rim well in 31-48n-90w to the Pure well, the top of the Embar dropped from —601 ft. to —5,943 ft., or 5,342 ft. difference, some 445 ft. per mile.

SOUTH LOUISIANA

Magnolia to Test Offshore Wildcat

NEW ORLEANS.—Magnolia Petroleum Co. is preparing to test its deep wildcat 6 miles out in the Gulf of Mexico off Terrebonne Parish shore. The 1 State Lease 673, Tract 474, Block 58, is at a total depth of 12,884 ft. Operators are reaming and will run oil string to test show of oil at approximately 11,800 ft.

Sohio Petroleum Co. 2 Farmers Land & Canal Co., 26-10s-7w, wildcat in the Holmwood area, Calcasieu Parish, is making an intial test for production through perforations at 10,412-17 ft. Total depth is 11,250 ft. Operators ran log to total depth before plugging back to 10,874 ft. Other sands were encountered from 10,320-31 ft., 10,350-70 ft., and 10,780-90 ft.

In the East Florence area, Vermilion Parish, Stanolind Oil & Gas Co. 1 E. M. Watkins, wildcat, 23-13s-1w, 6 miles east of Florence townsite, has been controlled. While drilling at 11,115 ft., the well blew out of control when the test hit a strong gas and salt-water flow. Operators are cleaning up around the location to continue operations. Projected depth is 12,000 ft.

Magnolia 45 Cameron Meadow Land Co., in 28-14s-13w, Cameron Meadow field, Cameron Parish, is testing a new deep sand through perforations at 8,678-88 ft. Well is cleaning through a 6/64-in. choke with 700 lb. flowing pressure. Total depth is 9,280 ft.

Also in Cameron Parish, 4 miles northeast of Mud Lake, Magnolia 1-C Lutcher, wildcat test, has been drilled to a total depth of 11,705 ft. in sand, and log is being run. Sands showing gas and condensate have been recorded from 9,065-9,100 ft., 9,275-9,335, 10,145-85 ft., 10,401-07 ft., and 10,435-535 ft. The 7-in. casing was set at 11,012 ft.

Phillips Petroleum Co. plugged its deep wildcat exploration in the Durald area of Evangeline Parish at a total depth of 12,346 ft. The 1 Vidrine, in 32-3s-1w, 7 miles southwest of Mamou field, reported no shows.

There were seven new locations reported for South Louisiana this week, all in proven areas. There were 17 completions, 11 oil and 6 dry, with 1 successful exploratory test, a new pay in Weeks Island in Iberia Parish. St. Mary Parish received the greatest activity, reporting four completions.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

Iberia Parish: New oil sand, Week's Island field—Shell Oil Co., Inc., 1 Myles Salt Co., 37-14s-6e, TD 12,435 ft., top sand 12,373 ft., perf. 12,380-95 ft., IP 446 bbl. per day through a 10/64-in. choke, gas-oil ratio 1,253, TP 2,575 psi., gravity 33°, 0.1 per cent water.

APPALACHIAN FIELD

Test in Wirt County Gages 4,500,000 Cu. Ft.

PITTSBURGH.—In Reedy district, Wirt County, West Virginia, Bear Run Oil & Gas Co. completed a test on G. P. McVey farm which gaged 4,500,000 cu. ft. of gas when shut in with the Berea topped at 2,371 ft.; gas, 2,371-85 ft.; rock pressure, 500 psi. in 24 hours; total depth, 2,385 ft. This is the fourth large Berea well in the area.

In Clear Fork district, Raleigh County, Columbian Carbon Co. completed 923 Rowland Land Co. in the Maxton sand with an open flow of 3,546,000 cu. ft. of gas, natural, with the Maxton sand at 2,144 ft.; gas, 2,218-33 ft.; rock pressure, 425 psi. in 48 hours; total depth, 2,233 ft.

In Elk district, Kanawha County, United Fuel Gas Co. completed 5,772 Edward Gebhart good for 5,955,000 cu. ft. of gas, natural, from the Oriskany sand. From surface elevation 1,055 ft. the Corniferous lime was logged at 5,222 ft.; Oriskany, 5,340-60 ft.; gas, 5,346-60 ft.; rock pressure, 800 psi. in 32 hours; total depth, 5,361 ft. Here, this company drilled 5,795 Nancy E. Myers through the Oriskany sand, and it was dry. Surface elevation was 1,131 ft.; Corniferous lime, 5,257 ft.; Oriskany, 5,380-98 ft.; total depth, 5,435 ft. United Carbon Co. drilled 1,384 R. A. Marshall through the Oriskany sand, and after shot it gaged only 127,000 cu. ft. of gas and was plugged. Surface elevation was 1,060 ft; Corniferous lime, 5,261 ft.; Oriskany, 5,387-5,421 ft.; shot, 5,390-5,412 ft.; total depth, 5,455 ft.

In Harvey district, Mingo County, United Fuel Gas Co. completed 5,835 J. L. Caldwell with a final open flow of 1,980,000 cu. ft. of gas from the Brown shale, total depth, 3,034 ft.

In Portland district, Preston County, William E. Snee, Orville Eberly et al, drilling another test in their recently opened lower Devonian pool, topped the Benson sand in No. 1 Cora E. Lewis farm, and the hole filled up with salt water and overflowed. Drilling was continued to 1,490 ft. with the water struck at 1,430 ft.; the surface string pulled, hole reamed to bottom where the surface string will be reset. The Benson in the previous tests on this structure did not show water which is believed a matter of sand conditions and may result later in discovery of a shallow gas pool.

New locations totaled 27, and were in

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Scott district, Boone County; Center and Sherman districts, Calhoun County; Cabin Creek and Elk districts, Kanawha County; Union district, Marion County; Kermit district, Marion County; McKim district, Pleasants County; Curry and Union districts, Putnam County; Grant district, Ritchie County; Geary and Harper districts, Roane County; Buckhannon district, Roane County; Reedy district, Wirt County; Union district, Wood County; Baileysville, Center, Huff Creek, and Oceana districts, Wyoming County.

In Summit Township, Erie County, northwest Pennsylvania, as a result of the good Oriskany gas well just completed, Appalachian Development Co. is rigging up a test on George S. Gerber farm, surface elevation 1,250 ft. Sylvania Corp. has staked a location for a test on Alton F. Hugger farm, elevation 1,236 ft.

New locations in the Southwest area totaled 13 and were in East Franklin and Valley townships, Armstrong County; Luzerne and Menallen townships, Fayette County; Center, Cumberland, and Jackson townships, Greene County; Washington Township, Indiana County; Morris and North Strabane townships, Washington County, and Salem Township, Westmoreland County.

EASTERN TEXAS

Delta Drilling Test Checks Low on Comanche

DALLAS.—Delta Drilling Co. 1 H. G. Lyon, 3½ miles northeast of Lindale, in northwest Smith County, was reported checking low on the Comanche limestone, placed between 6,230-45 ft., by samples, on an elevation of 536 ft. On last report it was drilling below 6,400 ft. However, drillers called the Woodbine at 5,390-5,405 ft., which was approximately 37 ft. high to Humble Oil & Refining Co. 1 Crone, a dry Woodbine test 2 miles northwest of 1 Lyon. Top of the Austin in the Lyon test put it 375 ft. high to the Humble failure, but thickening of the zone left it only 275 ft. high at the base of the formation.

A second sub-Clarksville well for the new Norman Paul field of Wood County, was brought in last week at Bobby Manziel 1 Clanton. Located east of Sun Oil Co.'s discovery, 1 Clanton kicked off without swabbing and flowed at the rate of 375 bbl. of oil a day through ¼-in. chokes, from perforations at 4,846-48 ft., and 4,878-92 ft. Other operations in the new field include location for a test ½ mile southwest of the discovery, by Homer Snowden, on a farmout lease from Manziel. It will be the 1 Martin & Clanton unit, in the southeast corner of the Davey Survey. Manziel's 1 J. A. McCorley, on the north side of the field, in the H. Anderson Survey, was to perforate in the Woodbine after finding no shows in the sub-Clarksville. Total depth was 5,650 ft. Extent of oil shows reported in the Woodbine, and top of the formation was not reported.

On the northeast side of Mount Sylvan field, Smith County, Humble Oil & Refining Co. 2 H. R. Dowell, in the James Dickinson Survey, and 1,400 ft. northeast of present production, was apparently a dry hole at 7,500 ft., total depth, in the Paluxy. A core at 7,395-7,405 ft. showed 1-in., at the bottom, of fine-grained sand with oil stain. A core to 7,511 ft. recovered 5 ft. of sand and sandy shale, with some stain; 2 ft. of black asphalt sand; 1 ft. of water-white sand and 2 in. of shale. A drill-stem test at that depth was unsuccessful when the tool stuck, but circulation indicated salt water.

EASTERN TEXAS (DISTRICTS 5 & 6)
WILDCAT FAILURE

Wood County: Bennett & Sorrels 1 R. G. Maclin, Wm. Wallace Sur., 3 mi. W

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Crow, OWDD, old total depth 5,510 ft. in shale, comp. originally 9-3-46, drilled to TD 7,821 ft. in Woodbine, no shows, elevation 368 ft.

SOUTHWEST TEXAS

Atascosa County Gets New Producing Area

CORPUS CHRISTI.—McFarland Drilling Co. 1 Henrietta Krisch Estate, wildcat 3 miles north of Poteet, in northern Atascosa County, swabbed 2 bbl. of oil per day through perforations at 3,568-78 ft., and 3,588-96 ft., in Austin chalk to open a new producing area in the Jurgen Dierks Survey 1,207. After being shut in overnight, the well had 200 ft. of oil in the hole. Total depth is 4,045 ft. in Edwards lime, and the 5½-in. casing is set to 3,607 ft.

A new oil-producing zone for Borregas field in Kleberg County has been opened by Humble Oil & Refining Co. 7 King Ranch-Borregas, east outpost well. Drilled to a total depth of 7,960 ft., this well flowed initial gage of 126 bbl. of oil per day through a ⅛-in. choke through perforations at 7,072-80 ft. The 5½-in. casing is set at 7,213 ft. Other producing sands for this field are at 6,376 ft., 6,250 ft., and 6,946 ft.

A 3-mile northeast extension of Borregas field in Kleberg County is indicated at Humble 8 King Ranch-Borregas, which recovered 675 ft. of oil, 20 ft. of oil-cut mud, and 80 ft. of fresh water on a drill-stem test at 6,234-42 ft. Test at 6,245-52 ft. recovered 1,124 ft. of oil and 10 ft. of oil-cut mud; test at 6,253-61 ft. recovered 1,890 ft. of oil and 10 ft. of mud. Operators are now reaming at total depth 6,261 ft.

The first producer in the 5,550-ft. zone in "South Kelsey" field in Starr County has been completed at Sun Oil Co. 1 Vicenta L. de Pena, for a potential gage of 42 bbl. of 41°-gravity oil per day through a 9/64-in. choke, gas-oil ratio 12,190, tubing pressure 1,400 lb., and casing pressure 1,850 lb. Production is through perforations at 5,545-56 ft. Total depth is 7,491 ft. with 5½-in. casing at 6,152 ft. This well also had tested gas-condensate at 5,010-35 ft., and 5,690-5,702 ft. This well is located in the Santa Teresa Grant.

La Reforma field in northeastern Starr County has been extended 1 mile southeast by Baldridge & King 1-B A. Guerra, which has been completed as a new oil pay for this field. No gage has been made of the flow. Production is through perforations at 6,046-56 ft. On a 16-hour drill-stem test at this depth the well flowed 43 bbl. of oil per day through 3/16-in. and ¼-in. chokes, with 110-lb. working pressure.

A new deeper oil pay for the Alta Mesa field in Brooks County has been opened by Standard Oil Co. of Texas 32 Mestena Oil & Gas Co., Lease 1. On a drill-stem test, tool open 10 minutes, at 4,515-18 ft., it recovered 750 ft. of clean 44°-gravity oil and 30 ft. of oil-cut mud, no water, with 1,040-lb. bottom-hole pressure open and 1,900 lb. closed, and 58-lb. working pressure. Operators are now coring ahead.

Ralph E. Fair, Inc. and Jack Woodward, Inc. have opened a new shallow oil pay in their 4-B Reynolds and Richardson in West Magnolia City field, Jim Wells County. Well is flowing 120 bbl. of oil per day through an 11/64-in. choke, with 280-lb. tubing pressure and 1,280-lb. casing pressure, through perforations at 4,838-41 ft. Gas-oil ratio 295. Total depth is 5,835 ft., and the 5½-in. casing is set at 4,900 ft.

The 33 new locations for South Texas district included 10 wildcats, 2 in Duval, and 1 each in Atascosa, Brooks, Hidalgo, Kleberg, McMullen, Starr, Travis, and Webb counties. Twenty-two completions, 12 oil and 10 dry, included 1 successful test and 9 dry wildcats, 2 in Willacy and

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Williamson counties and 1 each in Bastrop, Jim Hogg, Travis, Val Verde, and Zavala counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCAT

Starr County: New oil pay, South Kelsey field—Sun Oil Co. 1 Vicenta L. de Pena, in Santa Teresa Grant, top of pay 5,533 ft., TD 7,491 ft., perf. 5,545-56 ft., IP 42 bbl. oil per day through a 9/64-in. choke, gas-oil ratio 12,190, TP 1,400 lb., CP 1,850 lb., gravity 41.6°, no water.

SOUTHWEST TEXAS WILDCAT FAILURES

Bastrop County: E. J. Gracey et al 1 J. G. Bryson, in Ignatio Sartouche Sur., 5 mi. NE Bastrop, dry, TD 3,339 ft.

Jim Hogg County: Cecil H. McSpadden 1 Rueben Holbein, Sr., in Agua Nueva Arriba Grant, 27 mi. SE Hebbronville, 8 mi. SE Weil field, dry, TD 5,510 ft.

Travis County: E. R. Marts 1 M. H. Deats et al, in Thos. Toulson Sur. 12, 8 mi. S Manor, dry, TD 1,477 ft., top Austin chalk 1,008 ft.

Val Verde County: B. E. Wilson 2-A Wilson & Hodge, in GC&SF Sur. 57, 6 mi. N Juno, dry, TD 633 ft. (Completed as a water well).

Willacy County: Sun Oil 1 Ethel K. Scott et al, Share 64, San Juan de Carricitos Grant, 2 mi. NW of Willamer townsite, dry, TD 10,001 ft.

Humble 71 Sauz Ranch-Mulatos pasture, in Share 13, San Juan de Carricitos Grant, 12½ mi. E of Raymondville, dry, TD 11,453 ft.

Williamson County: Sam Michalk 1 Albert Patschke, Jesse White Sur., 5 mi. E Thrall and 3 mi. W Thorndale, near Milam County line, dry, TD 1,353 ft.

Sam Michalk 1 August Richter, in Jesse White, F. Bradley, and W. J. Pierce surveys, dry, TD 252 ft.

Zavala County: Texas Co. 1 Frank R. Newton, in Narciso Aguirre Grant, 7 mi. NE Crystal City, dry, TD 4,096 ft.

LA.-ARK.

Tests Seeking Production After Shows of Oil

SHREVEPORT.—A number of wildcats in the North Louisiana-Arkansas area were still trying to make commercial production after finding shows of oil. On the north edge of the old Falcon field, Nevada County, Spartan Drilling Co. 1 J. M. Stocks, 9-15s-22w, plugged back to 2,200 ft. and perforated at 2,101-07 ft., in the Tokio. On two 24-hour pumping tests, it made 88 bbl. of fluid, cutting 50 per cent salt water; then only 9 bbl. of oil and 73 bbl. of salt water.

In Union County, 2½ miles south of the Woodley field, McAlester Fuel Co. 1-A Patterson, 19-18s-14w, had total depth at 7,302 ft. in the Smackover, topped at 7,265 ft., with porosity logged at 7,268 ft. A drill-stem test at 7,267-7,302 ft. recovered the water cushion, plus 36 stands of salt water with a show of distillate. Additional shots at 7,267-73 ft. swabbed salt water, with a taste of distillate and some gas.

In Bienville Parish, 3 miles northeast of the Bryceland area, Lion Chemical Corp. 1 Ozley was drilling below 9,998 ft. in hard sand. Operators believed it was still in the Travis Peak. Barnsdall and others' Bossier Parish test, the 1 Johnson in 30-23n-12w, was drilling below 5,080 ft. in anhydrite. Cores at 3,305-25 ft. recovered 4 ft. of sandy shale with streaks of oil sand; between 3,325-45 ft. 17½ ft. of shale was recovered, having streaks of oil sand, and at 3,345-65 ft. cores showed shale, with no shows. In Sabine Parish, 9 miles south of Zwolle, R. W. Norton 1 Louisiana Long Leaf Lumber Co. had total depth at 5,492 ft., second plug-back depth at 4,125 ft.; perforated at 4,100-10 ft. and flowed salt water, with a show of gas after acid treat-

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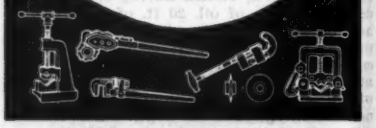

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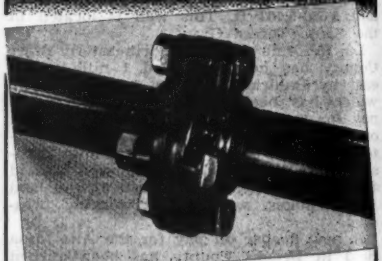

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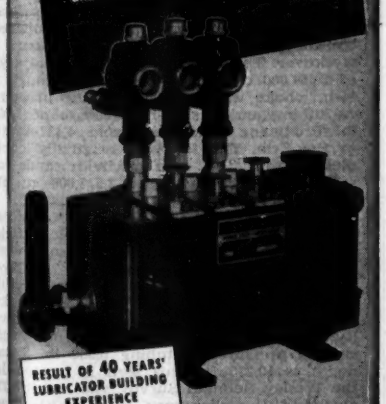

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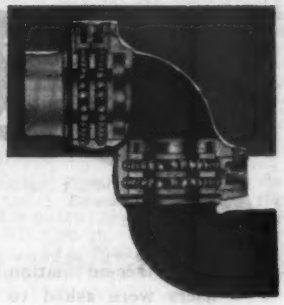

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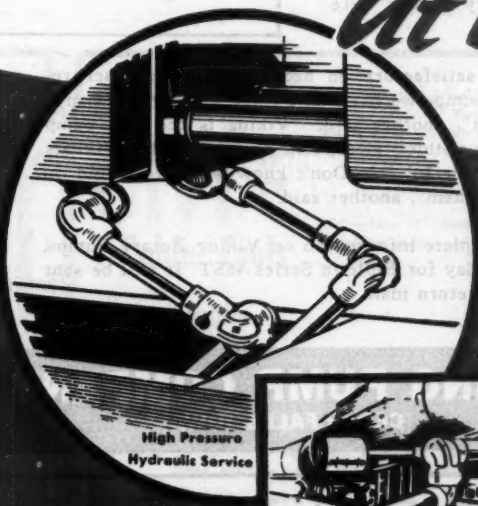

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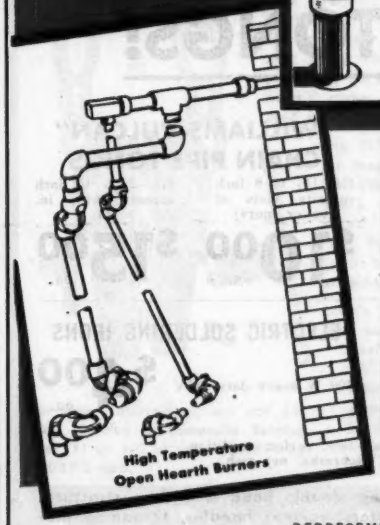

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ment. Perforations at 2,824-34 ft., acidized, flowed salt water with a slight show of oil. Operators retreated the latter holes and were testing.

In DeSoto Parish, a fire in Skelly Oil Co. 1 Nash, 20-12n-16s, late in the week was extinguished after burning continuously for 5 days. Gas flow was believed to be coming from the same sand as production in Logansport field. This 6,200-ft. Pettit test had total depth at 2,931 ft., in the Paluxy, when it blew out and caught fire. Sample tops logged were: Midway 366 ft., Arkadelphia 1,186 ft., Nacatoch 1,268 ft., and the Saratoga 1,372 ft.

NORTH LOUISIANA WILDCAT FAILURES

East Carroll Parish: Stanolind Oil & Gas Co. 1 Chicago Mill & Lbr. Co., NE SE 5-18n-12e, dry, TD 4,335 ft.

Richland Parish: Ray L. Fisher 1 Cooper, SW NW SE 21-17n-7e, dry, TD 3,308 ft.

R. T. McDermott 1 Boughton, NE SW SW 28-15n-6e, dry, TD 4,105 ft.

Winn Parish: Hunt-Atlantic-Nebo F-136 Goodpine, NW SW 21-10n-2w, dry, TD 6,432 ft., with packer set at 5,735 ft., had good blow of air but would not flow, swabbed salt water and show of gas, PB 5,765 ft. and drilled out to 5,783 ft., swabbed down to 4,000 ft., recovered salt water and no shows, no tops reported.

TEXAS GULF COAST

New Gas-Condensate Pool Opened in DeWitt County

HOUSTON.—A new gas-condensate pool has been opened in southern DeWitt County, 4½ miles south of Meyersville by Continental Oil Co. 1 Fred Ruschaupt. Drilled to a total depth of 9,194 ft., it flowed 1,308,000 cu. ft. of gas per day through a 3/16-in. choke, with gas-condensate ratio of 60,000. Estimated open-flow potential is 2,400,000 cu. ft. gas and 40 bbl. of condensate per day. Gravity is 56°. Production is through perforations at 8,576-89 ft.

Hinkle Drilling Co. 1 Miller-Vidor Land Co., discovery of the new North Vidor field, Orange County, J. W. Swisher Survey 2, gaged a potential of 2,200,000 cu. ft. of gas daily through a 12/64-in. choke with 2,860 lb. flowing pressure and 2,930 psi. shut-in pressure. Gas-condensate ratio 52,700, separating out 42 bbl. of 53°-gravity condensate daily with the gas flow. Open-flow calculation was 23,000,000 cu. ft. daily. Total depth is 7,910 ft., and production, through perforations in the Hackberry sand at 7,772-78 ft.

A new gas sand for North Louise gas field in Wharton County has been opened by Ralph Johnston 1 S. G. Shrader, a workover. The well flowed a potential gage of 2,464,000 cu. ft. of gas daily through a ¼-in. choke with 1,665-lb. flowing pressure on tubing and a shut-in pressure of 1,765 lb. Producing sands are from 4,437-49 ft. in the Frio. The test was originally completed from the regular field sands at 4,137-68 ft. for a gage of 2,517,000 cu. ft. daily.

Continental 1-A Mrs. Clay West Burns, second test in the new Clay West field of Live Oak County, 9 miles southwest of George West, opened a new shallow pay zone at 9,390-9,404 ft. It flowed 78 bbl. of condensate through a 13/64-in. choke with 3,616,000 cu. ft. of gas per day. Gravity 40°, tubing pressure 3,500 lb., and shut-in pressure on tubing 5,350 lb. Total depth is 10,275 ft. This well is located in the Wesley Sellman Survey and is 1,867 ft. north of the discovery well which was completed through perforations at 10,121-32 ft.

Eli Marks 1 A. B. Cohn Estate, gas-condensate discovery just west of the Esperson Dome field in Harris County, has

been shut in. This test was completed through perforations at 8,687-95 ft. where it flowed an ungaged amount of gas and condensate through a ¼-in. choke with 3,000-lb. flowing pressure on the tubing.

The Gray Wolfe Co. 3 Pinehurst unit opened new deep gas-condensate pay for the Pinehurst field of Montgomery County. Drilled to a total depth of 11,150 ft., it flowed an initial gage of 100 bbl. of condensate daily along with 1,650,000 cu. ft. of gas through a ¼-in. choke. Perforations are from 11,030-60 ft.

There were 20 new locations this week for the Texas Gulf Coast, 7 being wildcats, 2 in Fort Bend, and 1 each in Harris, Libery, Refugio, and Wharton counties. Three new pools were opened this week, one each in Brazoria, DeWitt, and Orange counties, and two new pays, one each in Humble field, Harris County, and Clay West pool, Live Oak County. Six dry wildcats were reported, one each in Fort Bend, Karnes, Liberty, Refugio, Victoria, and Wharton counties.

TEXAS GULF COAST SUCCESSFUL WILDCATS

Brazoria County: New gas-condensate pool—McCarthy Oil & Gas 1 Marie B. Nickell, in C. Smith League, 4 mi. W of Angleton, 2¼ mi. NE Bailey's Prairie field discovery and approx. 3½ mi. SW of Angleton field production, TD 12,007 ft., top sand 9,100 ft., perf. 9,100-10 ft., IP estimated 75 bbl. condensate per day, gas-condensate ratio 50,000, 3,500,000 cu. ft. gas per day through ¼-in. choke, TP 2,650 lb., gravity 52°, no water.

DeWitt County: New gas-condensate pool Continental Oil 1 Fred Ruschaupt, 4½ mi. S of Meyersville and approximately 1,400 ft. NW of Victoria County line in Patrick Dowlearn Sur., TD 9,194 ft., top pay 8,576 ft. (Massive Wilcox), perf. 8,576-89 ft., IP estimated open flow 2,400,000 cu. ft. gas and 40 bbl. condensate per day, gas-condensate ratio 60,000, gravity 56°. On 3/16-in. choke, TP 1,990 lb., SIP 2,840 lb.

Harris County: New oil sand, Humble field—Humble 2 H. C. House, in Mary Owens Sur., on north flank Humble field, TD 5,652 ft., top sand 4,678 ft., perf. 4,678-88 ft., IP 163 bbl. oil per day through a ¼-in. choke, gas-oil ratio 144, TP 125 lb., CP 405 lb., gravity 20°, no water.

Live Oak County: New gas-condensate pay, Clay West pool—Continental Oil 1-A Mrs. Clay West Burns, in Wesley Sellman Sur., 9 mi. SW of George West, TD 10,275 ft., top pay 9,390 ft., perf. 9,390-9,404 ft., IP 78 bbl. condensate per day through a 13/64-in. choke, and 3,616,000 cu. ft. gas per day, gravity 40°.

Orange County: New gas-condensate discovery, North Vidor field—Hinkle Drilling Co. 1 Miller-Vidor Land Co., in J. M. Swisher Sur. 2, 9 mi. N and little west of the North Port Neches discovery, TD 7,910 ft., Hackberry sand 7,767-98 ft., perf. 7,772-78 ft., IP 2,200,000 cu. ft. gas per day and 42 bbl. condensate per day through a 12/64-in. choke, gas-condensate ratio 52,700, TP 2,860 lb., SITP 2,930 lb., gravity 53°, no water.

TEXAS GULF COAST WILDCAT FAILURES

Fort Bend County: H. E. Williams and W. S. Thompson 1 Will Hartlage, 6½ mi. N Rosenberg, dry, TD 7,705 ft.

Karnes County: Sam G. Harrison and Geo. W. Graham 1 Kathleen J. Alexander, in Carlos Martinez Grant, 4 mi. E of Kenedy, dry, TD 8,515 ft.

Liberty County: Humble 1 Zoe B. McDonald, Josiah Blackman Sur., 3½ mi. NE of Splendora townsite, dry, TD 11,503 ft.

Refugio County: Stanolind Oil & Gas 36 Birdie D. Rooke, in J. M. Aldrete Grant, in La Rosa area, dry, TD 10,710 ft.

Victoria County: Rowan & Hope 5 Sally Ragsdale, in Valentin Garcia Grant, 1½ mi. E of East Telferner field, dry, TD 4,500 ft.

Wharton County: Floyd L. Karsten 1-A W. P. Gann, ETRR Sur., 2 mi. N of South El Campo production, dry, TD 7,203 ft.

MICHIGAN

Zero Weather Holds Up Michigan Operations

SAGINAW.—Zero weather held up Michigan oil and gas-field operations for the week with the result that completions were limited to five, all dry holes excepting the Major-Ride completion in Arbela Township, Tuscola County, which flowed 8 bbl. in 8 hours after acidizing. Completions included three wildcat dry holes.

Seven new locations were reported; two in Bay County, one each in Arenac, Clinton, Kent, Roscommon, and Van Buren.

MICHIGAN WILDCAT FAILURES

Allegan County, Fillmore Township: J. W. Lang Co. 1 Bauman-Groenveldt, NW NE SW 5-4n-15w, dry in Traverse limestone; TD 1,524 ft.

Salem Township: Harry Stroud 1 James Beck, NE NW SE 34-1n-13w, dry in Traverse limestone; TD 1,699 ft.

Van Buren County, Geneva Township: Stuart L. Godfrey 1 Henry and Willa Aulie, SE NE SW 30-1s-16w, dry in Traverse limestone; TD 1,052 ft.

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Fig. 103 — (See Below) Acme 18" B & R Safety Wire Line Drilling Clamp. For wells deeper than 3000 ft.

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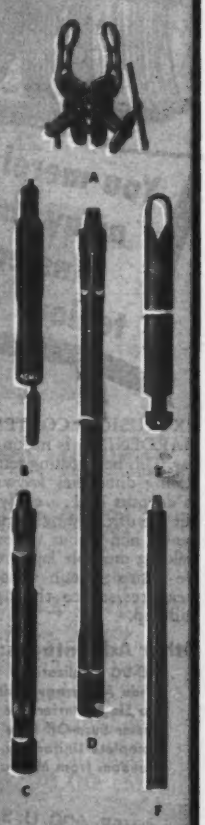

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CALIFORNIA

Exploration Launched In Santa Barbara County

LOS ANGELES.—W. W. Porter II, an independent geologist of Los Angeles, and Sunray Oil Corp. of Tulsa are launching an exploratory program on a 5,000-acre lease on the Los Flores and Careaga Ranchos in Santa Barbara County in California's Coastal District. A test well will be spudded in about 60 days. Objective is the same pay that is productive in the Orcutt field which adjoins the lease on the northwest.

About a dozen prospect wells have been drilled around the Orcutt field, the two most recent by Richfield Oil Corp. and Standard of California on the Los Flores Ranch, but none has found oil. Sunray entered California about a year ago through the acquisition of producing properties in the Santa Maria Valley field, but this will be its first exploratory well in the state. The company has just opened a West Coast office in Los Angeles with Harry Mack, vice president, in charge.

Present exploration in the Coastal District is centered largely in Ventura County. Deepest test is Standard of California 2 McGrath in 26-2n-23w, in the Montalvo area between Ventura and Oxnard. Hope for production is, however, fading rapidly as important showings have been lacking to present depth of 11,225 ft. Major companies have regarded the area favorably for many years.

Los Angeles County highlight is the abandonment by British-American Oil Producing Co. and Texas Co. of 2 Bodger in the Alondra area. The companies made what was considered an important discovery on the Bodger lease last summer, but subsequent drilling in the area has shown the productive area to be very small.

Second disappointment in the current flurry of exploration in the Castaic area occurred when Republic Operator Inc., suspended operations in 1 Republic Fee, 13-5n-17w, at 4,973 ft. Sidewall samples were taken and a few minor showings reported.

Outcome of two deep tests in Kern County hinges on formation tests presently being made. Belridge Oil Co. is perforating and testing in its well-regarded South Belridge test, 62-W-33, after drilling to 14,107 ft. A series of tests also are being made in Richfield Oil Corp. 21-33 in the Coles Levee field. This is an attempt to find oil below the presently productive Stevens sand. Total depth is 14,003 ft. No other information is available.

Standard of California, operator, is installing christmas tree for a full-fledged production test of 73-30V Middle Dome Corp., new deep sand discovery well on Kettleman Hills Middle Dome in 30-23s-19e. Well produced at better than 500 bbl. of 30°-gravity oil on a short test.

CALIFORNIA WILDCAT FAILURES

Kern County, Ant Hill area: International Exploration Co. 1 Linda, 11-29s-29e, dry, TD 3,600 ft.

Bacon Hills area: Anthony Oberholtz 1-A, 4-29s-20e, dry, TD 1,385 ft.

Fresno County, Cantua Creek area: The Texas Co. 1 Dahlgren, 7-16s-15e, dry, TD 7,847 ft.

Ventura County, Fillmore area: E. E. Perkins, Wileman, Ross & Couget, 1, 26-4n-20w, dry, TD 1,947 ft.

Los Angeles County, Alondra area: British-American Oil Producing Co. 2 Bodger, 22-3s-14w, dry, TD 9,231 ft.

Newhall area: Seaboard Oil Co., 8-2 Mission Land, 23-3n-16w, dry, TD 4,202 ft.

Tulare County, Terra Bella area: Gene Reid Exploration Co. 1 Miami, 23-22s-27e, dry, TD 815 ft.

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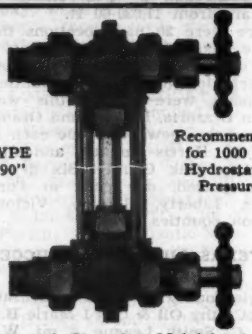

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PERMIAN BASIN

Extensions, New Horizons Hold Permian Interest

MIDLAND.—Extensions and new producing horizons in proven areas held attention last week. In Andrews County, on the northwest side of Fullerton field, Section 17, Block A-32, Texas Pacific Coal & Oil Co. 14-E Jackson was drilling below 8,225 ft. in the Devonian after a drill-stem test in that formation at 8,105-8,206 ft. Oil came to the surface in 72 minutes and flowed at the rate of 60 bbl. an hour. The flow was through ⅝-in. choke and gas was estimated at 850,000 cu. ft. per day. Originally scheduled to test the Ellenburger, operators said completion may be made in the Devonian when the entire section is tested.

Also on the northwest side of Fullerton, Fullerton Oil Co.'s 324-A Wilson, Section 15, Block A-32, was reported to have made only sulfur water on drill-stem test of the Devonian at 8,248-8,400 ft. Operators were to drill ahead to the Ellenburger. Stanolind Oil & Gas Co. 1 Young, Section 6, Block A-48, 2 miles west of production at Fullerton was to be abandoned after a 90-minute drill-stem test in the Devonian at 9,085-9,105 ft. recovered 180 ft. of water, drilling mud, and 300 ft. of sulfur water. No shows of oil or gas were found. Operators had previously asked the Railroad Commission for permission to continue drilling to 9,600 ft.

In the old Jordan area of Ector County, originally produced from around 3,500 ft., Gulf Oil Corp. 1-A University-Fogelson, Section 7, Block 35, University Lands, had gas to the surface in 18 minutes from a drill-stem test in the Ellenburger at 8,925-60 ft., and recovered some 2,150 ft. of clean, 43°-gravity oil, plus 225 ft. of oil and gas-cut mud. Gulf 421-E Goldsmith, deep test in Goldsmith field of Ector County, and the first scheduled Ellenburger test there, recovered 120 ft. of oil and gas-cut mud on a 90-minute test at 8,680-8,735 ft. in the Silurian. On last reports it was drilling ahead below 8,797 ft.

Extension of Leonard field across the Runnels County line into Coleman County, south of the town of Talpa, by O. P. Leonard 1-A Floyd Thompson. The well made a daily potential of 246 bbl. of oil through ⅛-in. tubing choke from the Palo Pinto limestone at 3,086-3,100 ft. It is the sixth producer for the field and the fourth in the Palo Pinto. Two wells produce from the Gunsight limestone around 2,400 ft.

In north central Crane County, 3½ miles north of production in Block 31 field, Gulf Oil Corp. 1-HH University was drilling below 9,112 ft. in limestone and chert. A 2-hour drill-stem test in the Devonian at 8,939-9,097 ft. put gas to the surface in 1 hour and 9 minutes, testing some 58,710 cu. ft. daily, and recovered 350 ft. of gas-cut mud having a slight show of oil.

Five tests were drilling in offset locations in the new Andector field of Andrews County. Southeast of the discovery, Humble Oil & Refining Co. 2-E R. B. Cowden had total depth at 8,275 ft. in lime and shale. Humble 1-G Cowden, 1½ miles south of the 2-E Cowden, was below 8,131 ft. Farther south, and offsetting Humble's 2-E Cowden, Plymouth Oil Co. 1-12 R. B. Cowden, and an east offset to a new producer, was drilling below 8,014 ft. Tide Water Associated Oil Co. 1 Cowden, south offset of the discovery, was setting casing at 8,600 ft.

WEST TEXAS (DISTRICTS 8 & 7-C) WILDCAT FAILURES

Andrews County: Placid Oil Co. et al 2 M. A. Thornberry, Sec. 3, Blk. A-42, PSL Sur., 2 mi. W Fuhrman field, dry, TD 11,337 ft., Wolfcamp 8,600 ft., Woodford shale 9,990 ft., Devonian 10,100 ft., Silurian 11,285 ft., elevation 3,214 ft.

Fisher County: H. F. Pettigrew 1 R. Herbst, Sec. 40, Blk. 1, HT&B Sur., 4½ mi. E, 1 mi. S Sylvester, dry, TD 4,862 ft. in limestone.

Howard County: Bond Oil Co. et al 1-C Texas, Sec. 17, Blk. 30, T&P Sur., 3½ mi. SE Coahoma, dry, TD 3,070 ft.

Presidio County: H. D. Wilcox 1 Conring, Sec. 102, Blk. 4, GH&SA Sur., dry, TD 4,523 ft. in volcanic ash, Eagleford shale 3,890 ft., elevation 4,497 ft.

Runnels County: F. A. Gillespie & Sons 1 King, D. Diaz Sur., 9 mi. NE Ballinger, dry, TD 4,081 ft., Caddo 4,047 ft., by samples, elevation 1,780 ft.

Scurry County: Humble Oil & Refining Co. 1 T. C. Davis, Sec. 339, Blk. 97, H&TC Sur., 6 mi. NW Snyder, dry, TD 8,027 ft., San Andres 1,650 ft., Clear Fork 2,690 ft., Pennsylvanian 6,700 ft., Mississippian 7,790 ft., Ellenburger 7,927 ft., elevation 2,413 ft.

Stonewall County: Standard Oil Co. of Kansas 1 Dora A. McMeans, Sec. 172, Blk. D, H&TC Sur., 2 mi. E Swenson, dry, TD 6,333 ft., Dothan 2,820 ft., Saddle Creek 3,110 ft., coal 3,140 ft., Flippen sand 3,170-90 ft., limestone 3,190 ft., Caddo 6,025 ft., Ellenburger 6,325 ft., elevation 1,716 ft.

Winkler County: Sunray Oil Corp. 1 Sealy-Smith, Sec. 31, Blk. A, G&MMB&A Sur., 5 mi. NW Monahans field, dry, TD 10,890 ft. in shale, Yates 2,570 ft., San Andres 4,000 ft., Clear Fork 5,580 ft., Mississippian 9,850 ft., Devonian 10,700 ft., elevation 2,841 ft.

SOUTHEAST NEW MEXICO

HOBBS.—The Texas Co.'s Lea County wildcat, 8 miles northeast of Lovington field, 1 W. C. Garrett, 22-16s-38e, took a drill-stem test at 5,470-5,530 ft., open 90 minutes, recovering 100 ft. of drilling mud with no shows. Previously it had cored 3 ft. of hard, fairly porous dolomite, stained and bleeding in spots at 5,510-19 ft. Samples from 5,300-10 ft. had a slight show of oil. A fishing job for bit cones delayed

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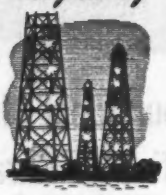
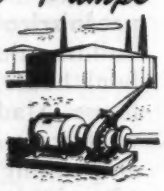


Survey

Power Tools

Pumps



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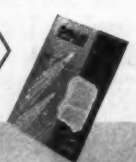

Onan PRODUCTS

ELECTRIC PLANTS

further drilling. Top of the San Andres was placed at 4,940 ft.

Devonian Oil Co. 1 Federal-Browne, NW NW 19-9s-38e, northeastern Lea County San Andres discovery, was installing pump for completion late last week. After acid treatment of the section at 4,945-5,012 ft., it swabbed 70 bbl. of oil a day, plus a small amount of salt water. Location is 10 miles east of Cross Roads and 20 miles west of the nearest production, in the Landon pool of Cochran County, Texas.

In Chaves County, Continental Oil Co., Yates et al 1 Mullis, 21-15s-29e, a wildcat 8 miles northwest of Square Lake, was drilling below 7,438 ft. in limestone. This 10,000-ft. test had previously reported a show of oil at 7,201-14 ft. but cores did not warrant a drill-stem test. A test of an oil-showing section at 7,150-60 recovered only mud.

Bay Petroleum Co. 1 Loomis, 23-20s-33e, northeast of Lynch in Lea County, was drilling below 3,369 ft. in limestone. Shows of gas were found at 3,297-3,307 ft., and a slight show of oil at 3,221-37 ft. Top of the Yates was placed at 3,165 ft.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURES

Chaves County: Fred Pool 1-A Denton, SE NE 35-5s-27e, dry, TD 2,402 ft., San Andres 1,946 ft., Brayburg 1,725 ft., elevation 4,109 ft., lost hole and skidded rig 20 ft. north.

Curry County: H. W. Snowden Oil & Gas Co. 1 Garrett, 26-5n-34e, 20 mi. SW Clovis, dry, TD 3,745 ft.

MISSISSIPPI

Smith County Wildcat Drilling Below 8,098 Ft.

JACKSON.—Late reports on wildcat tests included Woodley Petroleum Co. 1 Womack-Butler unit, 36-1n-6e, in Smith County, which was drilling below 8,098 ft. in sand and shale. Side-wall cores at 4,225 ft. recovered sand with no shows, and at 5,018 and 5,022 ft., recovered lignite but no shows. In Wayne County, Humble Oil & Refining Co. B-2 G. M. & O. Land Co., 24-9n-8w, had total depth at 9,866 ft. Operators were reaming to total depth before running casing.

In Jones County, Gulf Oil Corp. 1 Major, 29-6n-11w, had total depth at 8,736 ft. in white sand. Cores at 8,622-46 ft. recovered 10 ft. of sand with spotty saturation, but a drill-stem test with the packer set at 8,647 ft. recovered 230 ft. of fluid testing 99 per cent salt water and 1 per cent oil.

In Chickasaw County, Pan American Production Co.'s Cypress sand test, 1 H. B. Carter, 3 miles southwest of Okolona, in NW NW NW 24-12s-4e, was coring below 2,145 ft. in hard shale. No shows were reported. In Washington County, Warren Petroleum and Tide Water Associated Oil Co. 1 LeRoy Percy State Park, SE NE 8-15n-7w, 5 miles west of Hollandale, was shut down last week due to high water, at 2,490 ft. in sand.

MISSISSIPPI WILDCAT FAILURES

Hinds County: Kingwood Oil Co. 1 Lewis, NE SW 14-5n-1w, dry, TD 3,704 ft.

Issaquena County: Warren Petroleum 1 Jane S. Heath, NE NE 9-10n-8w, dry, TD 4,309 ft., Wilcox 1,838 ft., Midway 2,993 ft., gas rock 3,425 ft., Lower Glen Rose 3,466 ft.

Jefferson County: Humble Oil & Refining Co. 1-B Gordon, 44-9n-1w, dry, TD 11,379 ft., electric log tops: Wilcox 3,750 ft., Midway 7,011 ft., Austin 8,673 ft., Eutaw 8,965 ft., Marine Tuscaloosa 9,580 ft., lower Tuscaloosa 9,836 ft., Massive 9,940-9,959 ft., lower Cretaceous 9,963 ft., Paluxy 11,150 ft.

Lincoln County: Humble Oil & Refining Co. 1 School Land, NE NE 16-8n-5e, dry, TD 10,818 ft., electric log tops:

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Wilcox 4,063 ft., Midway 7,525 ft., Austin 9,123 ft., Eutaw 9,600 ft., Marine Tuscaloosa 10,400 ft., lower Tuscaloosa 10,580 ft.

Yazoo County: Carter Oil Co. 1 Carl Day, NE NE 9-12n-3w, dry, TD 7,001 ft., electric log tops: Marine Tuscaloosa 6,734 ft., unable to pick up Massive, lower Cretaceous 6,966 ft.

N. CENTRAL TEXAS

New Production Reported Northeast of Graham

WICHITA FALLS.—Completion was reported on a test bringing in new production in the James and Knox areas of Young County, 5 miles northeast of Graham. Grace & Grace 1 W. M. Harrison, in the Filipe Jaime Survey, flowed 108 bbl. of 43°-gravity oil in 3 hours, through ¾-in. choke on tubing, after acid treatment of 3,000 gal. Casing pressure was 600 lb., tubing pressure was 350 lb., and gas-oil ratio was 480:1. The producing zone is the Caddo limestone. It is a good well for the area, and the same operators had a southeast offset drilling ahead below 2,500 ft.

In Collin County, Standard Oil Co. of Texas 1 Newsome, in the John Cox Survey, northeast of Frisco, was drilling below 7,868 ft. on last report, and at that depth was 398 ft. in the Ellenburger, with no shows reported. On a drill-stem test, at 6,713-30 ft., the recovery in 1 hour was 500 ft. of water cushion and 30 ft. of drilling mud.

NORTH CENTRAL TEXAS (DISTRICT 9) SUCCESSFUL WILDCATS

Young County: Grace & Grace 1 W. M. Harrison, Filepe Jaime Sur., 5 mi. NE Graham, flowed 108 bbl. 3 hr. through ¾-in. choke, 43°-gravity, casing pressure 600 lb., tubing pressure 350 lb., GOR 480:1, Caddo lime 3,820-30 ft., TD 4,197 ft.

R. S. LeSage 2 B. W. Slater, Sec. 463, TE&L Co. Sur., 7 mi. N Graham, flowed 180 bbl. a day, 10/64-in. choke, Chappel limestone 4,800-12 ft., TD 4,814 ft., casing pressure 600 lb., tubing pressure 300 lb., GOR 1,000:1, gravity 44°.

NORTH CENTRAL TEXAS (DISTRICT 9) WILDCAT FAILURES

Archer County: Underwood Drilling Co. 1-L Campbell, Sec. 1,811, TE&L Sur., 5 mi. S Anarene, dry, TD 1,095 ft. in shale, Gunsight lime 1,064 ft.

Baylor County: Wofford Pain 1 W. H. Portwood, W. M. Loggins Sur., 3 mi. NW Spring Creek dry, TD 1,433 ft., show oil in sand 1,426 ft.

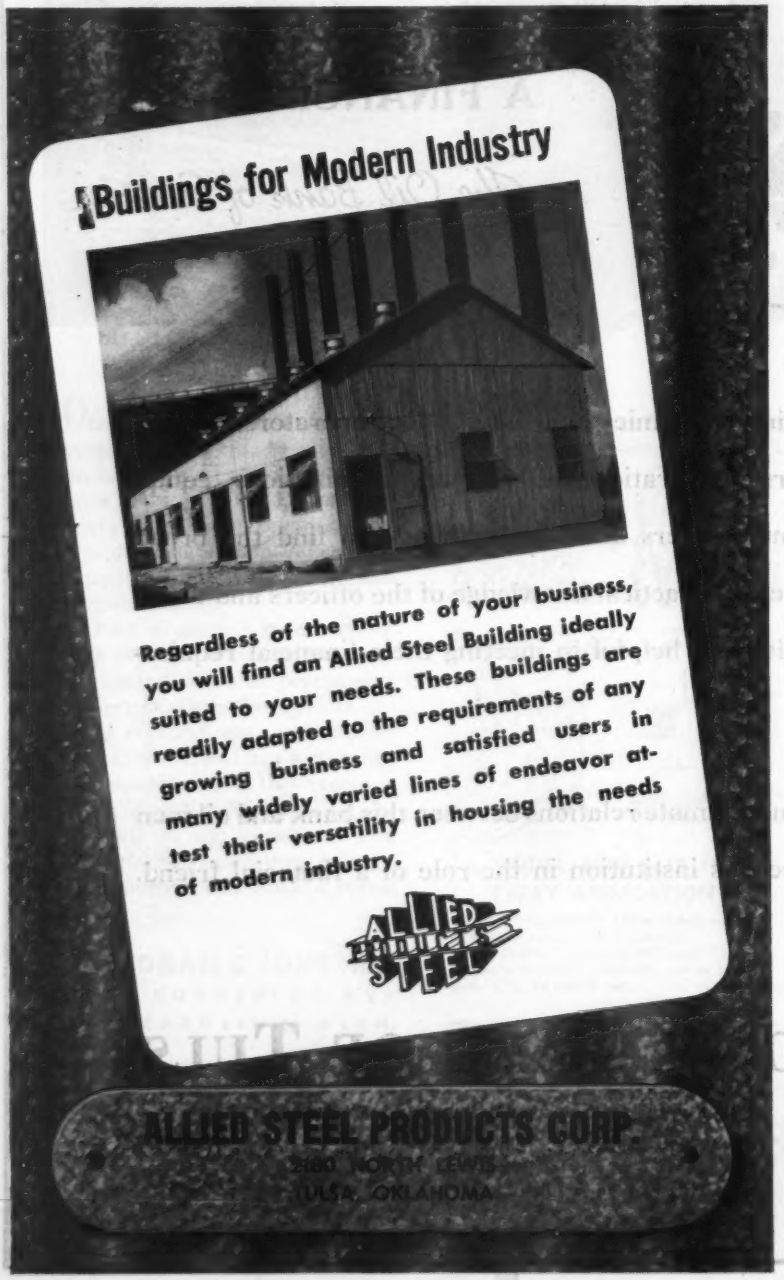
Clay County: G. W. Cooper 2 Viola Myers, Blk. 33, Hopkins Co. School Land Sur., 3 mi. S Bluegrove, dry, TD 4,696 ft., no tops reported.

Cooke County: Trumter Petroleum Corp. 1 W. A. Alexander, J. B. Self Sur., 5 mi. SW Burns City, dry, TD 1,838 ft., Ellenburger 1,759 ft., elevation 698 ft.

Jack County: G. E. Kadane & Sons 1 Shanafelt, I. Hughson Sur., 1½ mi. W Bryson, dry, TD 5,054 ft., Caddo lime with light odor 4,070 ft.

Montague County: Continental Oil Co. 1 S. T. Tompkins, Blk. 5, Calhoun CSL Sur., 6 mi. SE Montague, dry, TD 8,531 ft. in dolomite, Caddo 6,730 ft., Marble Falls 6,992 ft., soft limestone 7,898-7,922 ft., DST recovered gas-cut mud, Ellenburger 8,460 ft., elevation 1,179 ft.

(Continued on page 153)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ROCKY MOUNTAIN

Neiber Dome Discovery Flows 768 Bbl. Per Day

DENVER.—The Neiber Dome discovery in the Big Horn Basin in Wyoming in G. & G. Drilling Co. 1 Government, SE NE NW 19-45n-92w, Washakie County, flowed at the rate of 768 bbl. per day after overcoming the freezing of the tubing due to high pressure. The oil is of a good grade, running 40° to 41° gravity.

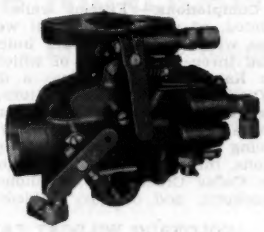
Production is coming from the Embar formation, topped at 10,025 ft., and is through perforations in the casing at 10,025-55 and 10,070-95 ft. The well was drilled to 10,980 ft., and then plugged back to the Embar. The Tensleep, top at 10,270 ft., although showing no water, was extremely hard, almost like granite. It went into the Madison lime at 10,736 ft., and found some saturation in the top, but not tested except for a drill-stem test at 10,173-10,980 ft., which resulted in a recovery of 8,840 ft. of mud, water, and oil and gas-cut mud. After plugging back it flowed 38 bbl. in 4 hours through a ¾-in. choke when the tubing froze up 300 ft. from the surface.

The oil was accompanied by 6,000,000 to 8,000,000 cu. ft. of gas. After killing the well with a blanket plug, 3,000 ft. of 5-in. liner was run between the 7-in. and the tubing and was circulated with hot oil to prevent freezing while a test was being made. The well then flowed 288 bbl. in 9 hours, when the tanks were full, and was shut down for more tankage.

The Neiber Dome is in the southeastern part of the Big Horn Basin, 12 miles due north of Zimmerman Butte, the nearest oil field on the rim of the basin. The Embar is found at approximately 4,300 ft. at Zimmerman Butte.

Other Big Horn Basin wildcats.—Pure Oil Co. 4 Unit, C SW NE 1-48n-93w, Worland field, Washakie County, Wyoming, 2 miles northwest of the discovery well, and ½

ENSIGN Combination Carburetors



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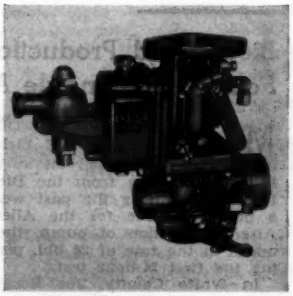
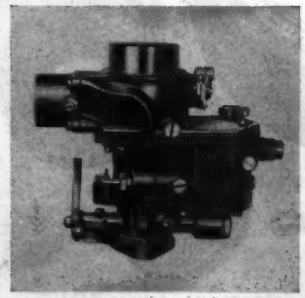
Check with Ensign Engineers at Huntington Park or Chicago for correct carburetor capacities and sizes.

Natural Gas, Gasoline or Butane



Model Kgn1



Model Cg

Model 2½" Tg

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mile northwest of Pure's No. 2, a small producer, is shut down for orders at 8,031 ft. It had the top of the second Frontier at 7,846 ft., and the third Frontier at 8,007 ft. A drill-stem test at 7,846-89 ft., open 90 minutes, resulted in the recovery of 175 ft. of drilling mud. Pure No. 1, the discovery, has extinguished fire and is reconditioning hole preliminary to resuming testing.

Carter Oil Co. 1 Five Mile, C NW SW 20-49n-93w, Five Mile Dome, Big Horn County, approximately 6 miles northwest of the Pure operation on the Worland Dome, was dry and abandoned at 9,430 ft. It had the top of the first Frontier at 9,015 ft., and the second Frontier at 9,187 ft.

Ohio Oil Co. 2 OPF-2, SE SE 31-48n-90w, which showed for a discovery in the Embar when it had a recovery of 250 ft. of oil and 200 ft. of oil-cut mud in 20 minutes at 4,245-4,300 ft., on the Hidden Dome structure, eastern rim of Big Horn basin, is drilling ahead at 4,528 ft. It was made a "tight" hole after penetrating the Embar.

Madison dry at Corley.—Continental Oil Co. 3 Van Noy, SW SE 34-44n-93w, Corley Dome, Hot Springs County, Wyoming, located ½ mile northwest of the discovery in the Embar, was deepened to test the Madison. It topped that horizon at 4,880 ft., and was drilled to 5,078 ft. It will plug back to test Embar. This was the third well on the structure which is now narrowed down to a small producing area.

Kutz Canyon test.—Paul B. English-Byrd-Frost, Inc., 1 Government, C NW SW 4-27n-10w, Kutz Canyon District, San Juan County, northwestern New Mexico, which 2 weeks ago recovered 3½ ft. of bleeding core from the top of the Dakota sand at 6,489-92½ ft., has resumed coring into the sand following the setting of the 6⅝-in. casing at 6,485 ft.

Cut Bank lime well.—Texas Co. 1 Blackbear, C SW SW 29-35n-6w, an outpost on the west side of Cut Bank field which was dry in the Cut Bank sands, was deepened to 3,375 ft., 15 ft. in the Madison lime, where it had a good show of live oil. It was estimated at 15 bbl. of sulfur water and 36 gal. of live oil of 36°-gravity in 24 hours, but not being commercial, was abandoned.

New operations.—Eight new operations were reported, of which one was in Rangely field in Colorado, one each in Garland and Lost Soldier and a wildcat in Niobrara County, Wyoming, and one each in Cedar Creek and Cat Creek, and two wildcats in Fergus County, Montana. The Wyoming wildcat is M. Seigel 1 Government, SE SW SE 20-36n-62w, Saddle Horn district, Niobrara County. The Fergus County wildcats are Joe Murphy 1 Government, SE SE SE 34-20n-13e, Arrow Creek District, and Arnold Smith 1 Anderson, C NE NE 11-21n-16e, Wolf Creek District.

Completions.—Fifteen wells were completed, of which 4 were oil wells, 5 were gas wells, and 6 were dry holes. Colorado had three completions, of which two were in Rangely, and one was a dry wildcat. Wyoming had six completions, of which two were oil wells, one was a gas well, and three were dry holes, two of the latter being wildcats. Montana had six completions, three gas wells in Bowdoin and one in Cedar Creek, one dry hole in Kevin-Sunburst, and one dry wildcat.

COLORADO WILDCAT FAILURE

Wiley, Prowers County: California Co. 1 Luster, C SE NE 10-22s-47w, TD 5,616 ft., tops Dakota 347, Permian 1,080, Kan-City 3,493, Mississippi 4,750, Viola 5,210, Arbuckle 5,289 ft., dry.

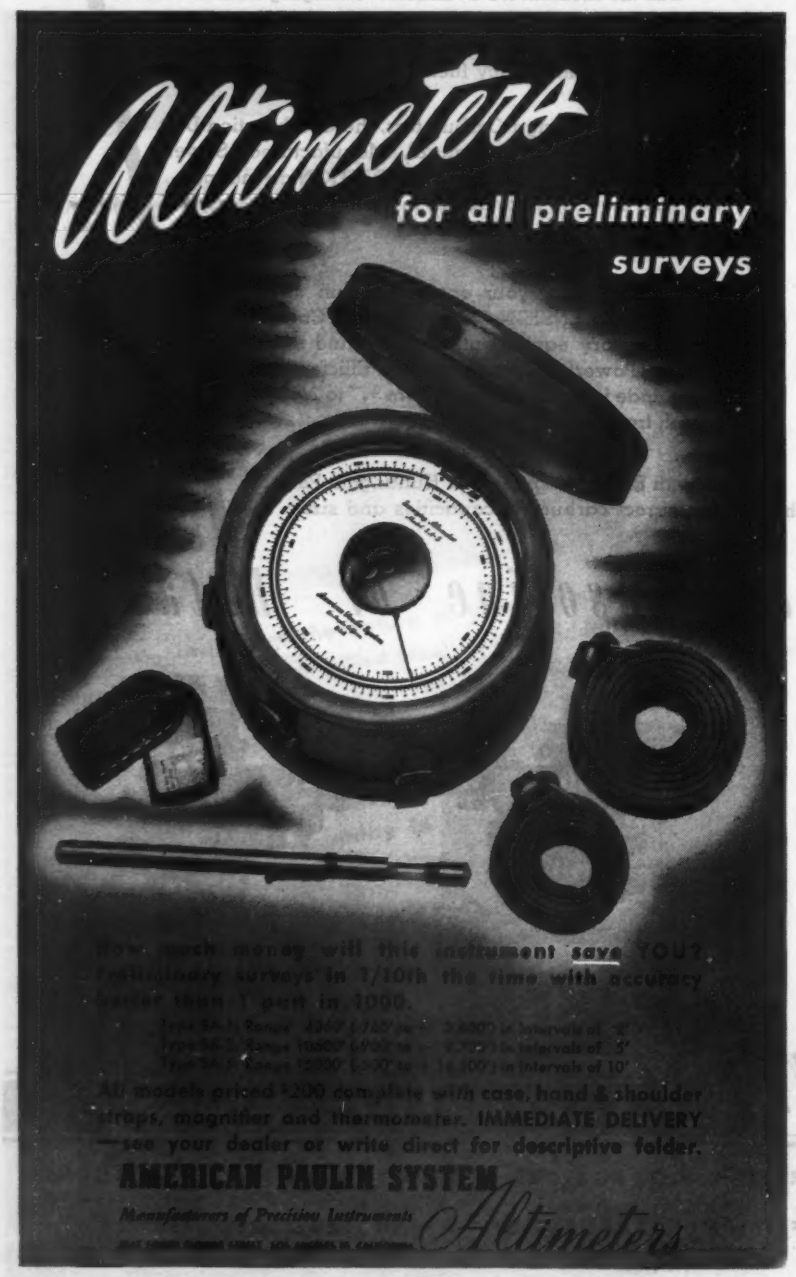
WYOMING WILDCAT FAILURES

Five Mile, Big Horn County: Carter Oil Co. 1 Five Mile, C NW SW 20-49n-93w, TD 9,430 ft., dry, tested Frontier series and recovered gas-cut mud.

Castle Creek, Natrona County: Roy Powers Drilling Co. 1 Gov't, NW NW NE 19-38n-80w, TD 2,550 ft., dry, water in three Wall Creek sands.

MONTANA WILDCAT FAILURE

Cut Bank, Glacier County: Texas Co. 1 Blackbear. C SW SW 29-35n-6w, TD 3,375 ft., dry in Cut Bank, top of Madison 3,360 ft., 15 bbl. sulfur water and 36 gal. live oil in 24 hours, plugged.



ILLINOIS

Biehl Sand Production Found in Allendale Area

MATTOON.—The Indilliky Oil Co. 1 H. Newson, N½ SW NE 18-1n-12w, Wabash County, swabbed oil at the rate of 12 bbl. per hour from the Biehl sand at 1,527-47 ft. during the past week to open a new pay zone for the Allendale area. After installation of pump, the well produced at the rate of 20 bbl. per hour during the first 24-hour test.

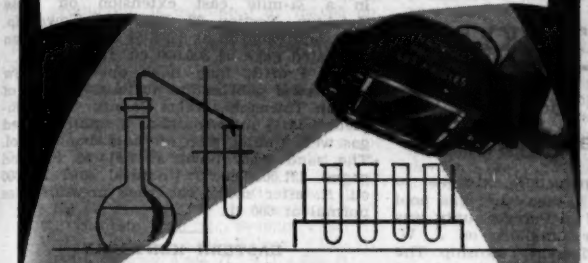
In White County, Joe Reznik et al 1 Embree, SE SE NE 29-6s-10e, located in the Concord pool, appears to be the best well completed in Illinois in recent weeks. After perforating and acidizing the McClosky lime at 3,030-36 ft. and 3,038-46 ft., the well flowed at the rate of 25 bbl. of oil per hour.

Marion County has two promising wildcats near completion. The National Associated Petroleum Corp. 1 George Boye, NW NE NW 21-4n-4e, is being put on pump to test the Aux Vases sand at 2,202-12 ft. The R. Halbert et al 1 Price, SW NE SE 28-1n-2e, is estimated at 40 bbl. from the Rosiclare at 2,123-38 ft. This well is now cleaning out and testing.

ILLINOIS SUCCESSFUL WILDCATS

White County: W. O. Allen 1 Ackerman,

Fluorescent Analysis...



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the PUMP FOR the JOB SENECA FALLS, N. Y.

NE NE SW 4-7s-10e, Aux Vases 2,900 ft., TD 2,913 ft., pumped 135 bbl. oil.

ILLINOIS WILDCAT FAILURES

Clay County: The Ohio Oil Co. 1 McGee, NW NW SE 22-5n-6e, dry at 2,902 ft., upper Kincaid 1,882 ft., Menard 2,073 ft., Glen Dean 2,287 ft., Barlow 2,436 ft., Benoist 2,628 ft., Aux Vases 2,698 ft., Ste. Genevieve 2,751 ft., McClosky 2,814 ft.

ILLINOIS SUCCESSFUL WILDCATS

(Week ended January 11)

Clay County: National Associated Petroleum Corp. 1 Golden, SW NE SW 17-3n-6e, pumped 80 bbl., 10-qt. shot 2,762-72 ft., Benoist 2,758-66 ft., TD 2,772 ft.

Gallatin County: Delta Drilling 1 Ingleton, SE NE SW 34-8s-9e, pumped 40 bbl., Pennsylvanian sand 1,564-80 ft., TD 1,587 ft.

Wabash County: F. J. Fleming et al 1 Wm. Berberick, SE SE NW 26-1s-14w, SE SE NW 26-1s-14w, pumped 250 bbl., perf. 2,966-68 ft., McClosky 2,966-77 ft., TD 3,016 ft.

OHIO, KENTUCKY

Oakfield Gas Pool Gets Important Extensions

COLUMBUS.—An important extension to the Clinton and Medina sand gas pool northeast of Oakfield in Perry County was drilled in by Walter Linkhorn on J. W. Begum, Section 28, Pleasant Township. The extension was 1 mile to the southwest and the gas was in the Clinton sand, which was reached at 3,735 ft. and drilled to 3,771 ft., where the well gaged 2,457,000 cu. ft. Four wells are now drilling and five locations have been made in the pool. In the same pool, Bert Davis found the Clinton dry and drilled down to the Medina sand in a ¼-mile east extension on Jesse Ketchum, Section 22, Bearfield Township. The sand came in at 3,848-51 ft. and had an estimated gage of 300,000 cu. ft.

Roy Proffitt may have opened a new Berea sand pool in the northeast corner of Sutton Township, Meigs County. The completion is ½ mile south of a small isolated gas well 2 miles west of the Lebanon pool. The sand was found at 1,974-86 ft., and gaged 231,000 cu. ft. natural and 320,000 cu. ft. after shot. The rock pressure was normal at 600 lb.

EASTERN KENTUCKY

ASHLAND.—Two completions, one for nearly 1,250,000 cu. ft. open flow, were noted in the eastern Kentucky field during the week.

Kentucky-West Virginia Gas Co. completed Well 5,713 on the George Williamson property, Martin County, at a total depth of 1,071 ft., for 1,212,000 cu. ft. in Maxon.

The same company completed Well 5,685 on the Scott Burke land, Floyd County, total depth, 3,536 ft., open flow of 622,000 cu. ft. in shale.

WESTERN KENTUCKY

OWENSBORO.—The Carter Oil Co. 1 E. J. Melton, SE NE SW 4-N-23, opens a new pay zone for the Tunnel Hill field of Henderson County. A 3-hour drill-stem test at 1,746-76 ft. showed 570 ft. of clean oil, 120 ft. of mud-cut oil, and 240 ft. of heavily oil-cut mud. A second drill-stem test is being run at 1,766-88 ft. in the Waltersburg sand. The Tunnel Hill field was discovered in October 1946, and all production to date has been from the Cypress sand at approximately 2,230 ft.

INDIANA

EVANSVILLE.—Gibson County has a prospective pool opener in the Sam Malis 1 Perry Fleener, NE SW SW 22-3s-12w. Pipe was set to test the McClosky at 2,648-54 ft. and 2,682-88 ft. and 2,698-2,704 ft. A drill-stem test showed 90 ft. oil-cut mud and no water. The Waltersburg sand showed saturation from 1,863-91 ft. but has not been successfully tested.

INDIANA WILDCAT FAILURE

Knox County: H. E. Ledbetter 1 I. Bloom, SE SE NW 32-1n-11w, dry at 2,321 ft., elev. 401 ft., Palestine 1,487 ft., Menard 1,510 ft., Viola 1,627 ft., Tar Springs 1,642 ft., Glen Dean 1,735 ft., Barlow 1,892 ft., Benoist 2,044 ft., Ste. Genevieve 2,174 ft., O'Hara 2,192 ft.

OKLAHOMA

Sohio Starts Extension Test in Hughes County

AN effort to extend the newly discovered Wetumka Southeast pool ½ mile north and ¾ mile east is being made by the Sohio Oil Co. 1 Darkes-Wallace-Davis, SE SW NW 29-9n-11e. This operation was forced by a short term lease. Phillips Petroleum Co. 1 Hopiye-Wesley, NW NW NE 31-9n-11e, a direct offset to the east of the discovery well is the second flowing well for the area. Cromwell sand was penetrated from 3,090-3,101 ft. The well flowed 45 bbl. of oil the first hour through a ½-in. choke, 475 bbl. in 14¾ hours through a ¼-in. choke, and 175 bbl. in 24 hours through a ⅛-in. choke. The direct offset to the north of the discovery well, O. H. Grimes 1 Crawford, SE SE SW 30-9n-11e, will be drilled deeper after testing 15 bbl. per day from the Cromwell at 3,082-3,110 ft.

In the Southwest Wayne pool, McClain

Cooper-Bessemer Puts Power in the Pull

Right: Type FW Supercharged Locomotive Diesel Engine manufactured by Cooper-Bessemer. *Left:* Drop-Forged Connecting Rod and Cap (forged in one piece) used in above unit.

This 70-ton switch locomotive, equipped with a compact locomotive diesel engine is rated 660 H.P. at 1000 RPM... just another example of "Cooper-Bessemer at Work."

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County, the Magnolia Petroleum Corp. 1 Grimes, NW NW SW 24-5n-2w, is testing the Hunton lime through casing perforations at 6,743-70 ft. The well flowed 340 bbl. of oil in 13 hours through 8/64-in. choke, the gas-oil ratio being 1,260 to 1. Gas production is estimated at 786,000 cu. ft. per day. Casing pressure tested 1,200 psi. and tubing pressure 1,100 psi. Gravity of oil is 43°.

OKLAHOMA SUCCESSFUL WILDCATS

Lincoln County: Danciger & Mercury Drilling Co. 1 Shaffner, C NE SE 7-13n-6e, pumped 8 bbl. of 20°-gravity oil per day from Simpson dolomite at 4,370-4,428 ft., Prue stringers 3,138 ft., Skinner 3,304 ft., Earlsboro 3,590 ft., brown lime 3,730 ft., Mayes 3,969 ft., Woodford 4,175 ft., Hunton 4,205 ft., Sylvan 4,254 ft., Viola 4,338 ft., first Wilcox 4,408 ft., second Wilcox 4,434 ft., TD 4,440 ft.

Oklahoma County: Peppers Refining Co. 1 Martin Estate, C SW NE 20-13n-2w, produced 17,700,000 cu. ft. gas per day through ¾-in. tubing choke from Bartlesville at 6,065-84 ft.; Cleveland 5,520 ft., Oswego 5,793 ft., Hunton 6,118 ft., Chimney Hill 6,253 ft., Sylvan 6,360 ft., TD 6,393 ft.

OKLAHOMA WILDCAT FAILURES

Beaver County: Gulf Oil Corp. 1 Ratzlaff, SE SE NW 9-3n-21ecm, dry, TD 8,920 ft., Viola 8,325 ft., Simpson 8,547 ft., no Wilcox, Arbuckle 8,620 ft.

Garfield County: Herndon Drilling Co. 1 Buzz Bennett, C N½ NW SE 25-20n-4w, dry, TD 4,680 ft., Middle Layton 4,442 ft., lower Layton 4,589 ft., upper Checkerboard 4,653 ft.

McIntosh County: Kerr-McGee 1 Autrey, C SE NW 10-9n-13e, dry, TD 3,497 ft., brown lime 1,660 ft., Booch 1,905-25 ft., Gilcrease sand 2,665 ft., Hartshorne 2,125 ft., Atoka 2,150 ft., Wapanucka 3,150 ft., Union Valley 3,355 ft., Cromwell 3,450 ft.

Payne County: Mid-Western Drillers & Associates 1 Rosa Finnell, C NW SE 30-19n-1w, dry, TD 5,636 ft., Layton 4,038 ft., Oswego 4,687 ft., Bartlesville 5,014 ft., Woodford 5,318 ft., Sylvan 5,389 ft., Simpson dense 5,460 ft., first Wilcox 5,495 ft., second Wilcox 5,616 ft.

CANADIAN FIELDS

Imperial's Leduc Test Deepening After Shows

CHATHAM.—In the Leduc area, south and west of Edmonton, Imperial-Leduc 1, LSD 5, 22-50-26w4, is deepening after striking pronounced showings of oil and gas. Gas showings were reported around 4,735 ft. and the well is deepening below 5,031 ft.

Imperial officials have given no estimates of potential production, pending further drilling which will precede a definite production test. It is unofficially reported, however, that some time after the initial gas shows were encountered, there was a gush of oil which shot 90 ft. into the air and sprayed the 158-ft. derrick. The field is located 9 miles west and slightly north of Leduc, which is 18 miles south of Edmonton.

These are the first substantial showings of oil and gas encountered at such depths in the Central Alberta plains area, production in the Viking-Kinsella gas field and the Wainwright and Vermilion oil fields coming from Cretaceous formations slightly above or below 2,000 ft. The Leduc showings are apparently from a limestone formation. Imperial-Leduc 2 has location in LSD 1, 16-50-26w4, a mile south and slightly west of No. 1.

KANSAS

Seward County Wildcat Has Gas in Pennsylvanian Sand

STANOLIND Oil & Gas Co. 1 Feathers, SW SW NE 15-35s-33w, Seward County, is a 4,695,000-cu.-ft. gas well from the basal Pennsylvanian sand, topped at 6,152 ft. This wildcat test, which is located 4 miles southeast of Liberal, was drilled to a total depth of 8,243 ft., or 221 ft. in the Arbuckle. Other formations reported are: Herrington at 2,630 ft., Fort Riley at 2,820 ft., Lansing at 4,414 ft., Mississippi at 6,200 ft., Simpson at 7,965 ft. and Arbuckle at 8,022 ft. The hole was plugged back to 6,206 ft. and 5-in. casing was set on top of the sand. Being the first gas well from the Pennsylvania, in the Hugoton area of southwestern Kansas, the test merits considerable attention. Gas or gas-distillate has now been found from two formations below the Permian, which produces gas in the field proper, thereby suggesting the possibility of important discoveries being made from deeper formations.

W. L. Hartman 1 Rempke, NW NW SE 21-9s-18w, a wildcat test located 4 miles southeast of the Barry Southeast pool of Rooks County, had a fill-up of 365 ft. of oil in 9 hours from the Arbuckle lime, topped at 3,576 ft. After being treated with 1,000 gal. of acid, the hole filled with 2,400 ft. of oil overnight and swabbed 10 bbl. of 27.5°-gravity oil per hour.

KANSAS SUCCESSFUL WILDCATS

Ellis County: Skelly Oil 1 M. R. Allen, SE SE SW 22-11s-19w, pumped 323 bbl. of 19.5°-gravity oil per day from Arbuckle at 3,638-43 ft.; anhydrite 1,395 ft., Topeka 3,080 ft. with a show of oil, Lansing-Kansas City 3,313 ft., conglomerate 3,580 ft., Simpson 3,613 ft., TD 3,643 ft.

Continental Oil 1 Warren Mortgage Co., SE NE NE 3-11s-18w, produced 3,000 bbl. of 32.5°-gravity oil per day from Arbuckle at 3,618-25 ft.; anhydrite 1,364 ft., Lansing-Kansas City 3,330 ft., Basal Kansas City 3,530 ft., conglomerate 3,542 ft., Simpson 3,592 ft., TD 3,625 ft.

McPherson County: W. C. McBride 1 Waln, NE NE SE 12-19s-1w, produced 2,836,000 cu. ft. gas per day from Mississippi lime at 2,832-42 ft., TD 2,875 ft.

Seward County: Stanolind Oil & Gas 1 Feather, SW SW NE 15-35s-33w, produced 4,965,000 cu. ft. gas per day from Cherokee sand at 6,157-85 ft.; Herrington 2,630 ft., Ft. Riley 2,820 ft., Lansing-Kansas City 4,406 ft., Fredonia 6,665 ft., Osage 7,352 ft., Mississippi lime 6,200 ft., Maquoketa 7,834 ft., Simpson 7,965 ft., Arbuckle 8,022 ft., TD 8,100 ft.

KANSAS WILDCAT FAILURES

Marion County: Kiowa Drilling & Bay Petroleum 1 Weinbrenner, NE NE NW 36-19s-1e, dry, TD 3,249 ft., Lansing-Kansas City 2,174 ft., Mississippi lime 2,744 ft., Viola 3,174 ft., Simpson 3,231 ft.

Russell County: Brunson Drilling Co. & D. E. Dunne, Jr., 1 Anne Boller, NE NE SW 10-14s-13w, dry, TD 3,402 ft., Topeka 2,650 ft., Kansas City 3,020 ft., conglomerate 3,344 ft., Arbuckle 3,367 ft.

Sheridan County: Royer & Farris 1 Leo Morgan, NE SE SE 5-9s-26w, dry, TD 4,008 ft., anhydrite 2,211 ft., Heebner 3,723 ft., Lansing-Kansas City 3,763 ft., Basal Kansas City 3,985 ft.

MISSOURI WILDCAT FAILURE

Gentry County: Dan Short 1 Fred Howatt, SW SW NE 9-61n-33w, dry, TD 1,180 ft., Lansing-Kansas City 292 ft., Basal Kansas City 572 ft., Cherokee 755 ft., Tarkio 1,150 ft.

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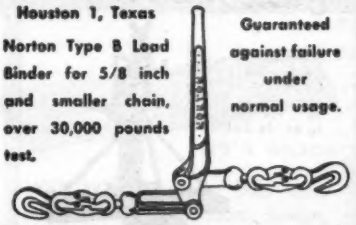

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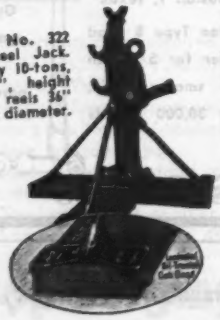

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Among the Drilling Contractors

Summit Drilling Co. is contractor on the Mid-Continent Petroleum Corp. 1 Morningweg, in SE SE NE 23-23n-1w, Noble County, Oklahoma. Derrick is up and pits were being dug.

Snyder & Head, Calgary, Alta., drilling the important 1 Berry Creek Petroleums test for gas in LSD 3, 9-31-14w4, near Hanna, are deepening after setting 10¾-in. casing at 159 ft.

Harbor Drilling Co. has contract to drill the Ed Swearer and Phillips Petroleum Co. 1 Nichols, in SW SW NW 28-28-13, Pratt County, Kansas. The test is receiving dry-hole support from Sunray Oil Corp.

Falcon Seaboard Drilling Co., Tulsa, has started operations at the 1 Favor, in SE SW NW 26-15n-1e, southeastern Logan County, Oklahoma. The wildcat will be a Wilcox sand test but upper horizons will be checked. Location is 5¾ miles north of Luther and 2¾ miles west of Fallis. It is 1½ miles north of the Coon Creek Wilcox sand pool.

Glenn Poal is drilling contractor on the Derby Oil Co. 1 Swenson, in SW SW SW 8-9-21, in the Morel pool of Graham County, Kansas. The test was drilling below 1,700 ft. It is on a 160-acre farmout from Barnett Drilling Co. and is being supported by Skelly Oil Co. and Sinclair Prairie Oil Co.

Clyde B. Miller will drill a wildcat for Arthur J. Boeve and W. D. Gannett. The test is the 1 Leon Ocobock, in NE SW NW 22-5n-13w, Ottawa County, Michigan.

Herndon Drilling Co. is drilling the Gulf Oil Corp. 1 Effie, in SE SE NE 14-20-15, a semiwildcat test ½ mile northwest of the Unruh pool in Barton County, Kansas.

J. I. Roberts Drilling Co. is contractor on the Gulf Refining Co. 6 Hopper, in SE 28-17n-9e, in the Delhi field of Richland Parish, Louisiana. The test is scheduled to go to 3,400 ft.

Rine Drilling Co., Great Bend, Kans., has contract to drill the Lion Oil Co. 1 Merton, in SW SW NW 12-20-14, Barton County, Kansas. Location is on a block of 849 acres including all of 1-20-14 and all of Section 12 north of the Arkansas River, including the river bed.

McCutchin Drilling Co. is contractor on the Texas Co. 4-B Caddo Levee Board, in SW SE 33-21n-16w, Caddo Parish, Louisiana. The well is scheduled as a 2,500-ft. test.

Texola Drilling Co. has been awarded drilling contract on the Sohio Petroleum Corp. 1 Davis, which has been staked in SE SW NW 29-9n-11e, Hughes County, Oklahoma.

Shaw Petroleums, Lloydminster, Alta., have completed 1 Dimsdale, LSD 2, 14-50-2w4, for Lloydminster Oil

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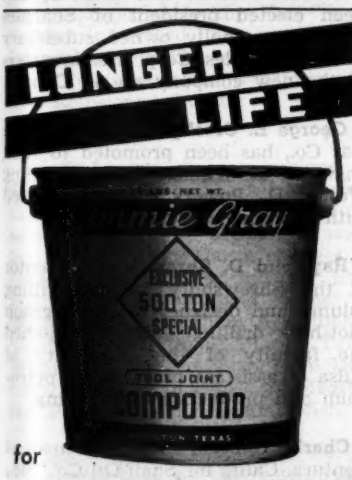

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Producers. The new well, completed at 1,986 ft. in 7 days, got the producing Sparky sand at 1,978 ft. and extends the Alberta end of the field to the north and west a distance of 2 miles.

Olson Drilling Co. is contractor on the Shell Oil Co., Inc., 1 Joe G. Walter, in C NE SW 14-10n-21w, Beckham County, Oklahoma. Total depth is 12,267 ft., where circulation was lost a few days ago.

S. W. Petrie, Gainesville, Tex., is drilling contractor on The Texas Co. 1 Williams, in F. Travino Survey A-1243, wildcat in Denton County, Texas. Cellar was being dug and derrick being moved in for the 2,500-ft. test.

Peterson Drilling Co. is contractor on the California Co. 9 Applegate, in Section 14-9n-10e, Concordia Parish, Louisiana. The scheduled 5,000-ft. test is in the Lake St. John pool.

Wheless Drilling Co. will drill on contract the Arkansas Fuel Co. et al 1 McCorley, in the P. Dougherty Survey A-5, in the Scottsville area of Harrison County, Texas. Location was being cleared and material moved in for the wildcat test to the Travis Peak.

West Central Texas

(Continued from page 146)

WEST CENTRAL TEXAS (DISTRICT 7-B) SUCCESSFUL WILDCATS

Taylor County: Dunigan Bros. 1 A. W. Hunter, Subd. 10, S½ W. R. Willis Sur., 7 mi. SW Tye, pumped 20 bbl. oil, plus 20 per cent water, Flippen limestone 2,440-46 ft., TD 2,446 ft.

Brown County: Robert J. Milligan et al 1 W. C. Tolleson, R. H. Smith Sur. 15, 3 mi. SE Brownwood, flowed 5,500,000 cu. ft. gas, Marble Falls 1,460-1,618 ft., TD 1,618 ft., shut-in pressure 720 lb.

WEST CENTRAL TEXAS (DISTRICT 7-B) WILDCAT FAILURES

Callahan County: E. M. Thomasson 1 Dorse Odom, Blk. 5, SPRR Sur., 3 mi. SW Admiral, dry, TD 950 ft. in shale.

C. C. Woodson 1 Hugh Ross, Jr., Blk. 108, BBB&C Sur., 1 mi. S Baird, dry, TD 1,655 ft. in shale.

Shackelford County: Woodley Petroleum 1 G. R. Davis, Sec. 39, Blk. 12, T&P Sur., 8 mi. SW Albany, dry, TD 4,981 ft., Saddle Creek 1,293 ft., Flippen 1,354 ft., Palo Pinto 2,700 ft., Caddo 4,278 ft., Ellenburger 4,900 ft., elevation 1,765 ft.

CALENDAR

February

American Institute of Chemical Engineers, regional meeting, Brown Hotel, Louisville, Ky., February 16-19.

Kansas Oil Men's Association, annual convention, Hotel Broadview, Wichita, February 17-18.

Texas Railroad Commission, statewide proration hearing, Rice Hotel, Houston, February 18.

Southern California Meter Association Rio Hondo Country Club, Downey, February 20.

American Petroleum Institute, public-relations operating committee, meeting, Chicago, February 25-26.

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A CAREER that included chemistry, engineering, and law has led William M. Stratford to the presidency of Texaco Development Corp.

Associated with Texaco since 1919, Stratford recently was elected to succeed R. J. Dearborn, who retired after 27 years with The Texas Co. and the associated development corporation.

Stratford joined Texaco as a chemist in the company's research laboratory at Port Arthur, Tex., in 1919, after serving the year before as a pilot in the Naval Reserve. The following year he was graduated from Rice Institute and in 1921 received an M.A. degree from Massachusetts Institute of Technology.

Later he was transferred to the New York offices as patent attorney. In 1933 he was elected a vice president and director of Texaco Development, and in the same year received a bachelor of laws degree from Fordham University.

Now 49 years of age, Stratford holds numerous patents on many types of producing and refining equipment.

R. G. Bandy, crude purchaser for Sohio Petroleum Co. in Oklahoma City, has been transferred to Evansville, Ind. He has been succeeded by **N. W. Sublett,** who formerly was in Tulsa.

F. D. Juenzly, Jr., senior technologist of Shell Chemical Corp. in San Francisco, has been made assistant plant superintendent in Houston. Other corporation changes include **W. Elick,** from maintenance foreman at Torrance to senior engineering inspector in Houston, and **R. E. Hughes,** engineer at Torrance to senior engineering inspector at Houston.

M. E. Tolleson and **C. A. Houy** have been elected vice presidents of Republic Natural Gas Co. Tolleson, who has been with the company or its predecessors since 1930, will be in charge of oil production. Houy, who joined the firm as a junior engineer in 1941, will be in charge of gas production.

C. A. Lingo, G. H. McKay and **W. C. Norman** have been elected vice presidents of Tennessee Gas & Transmission Co. Lingo will serve as secretary and Norman as treasurer. **Ronald L. McVey** has been named assistant treasurer, and **W. C. McGee, Jr.,** assistant secretary.

Paul D. Balbin, Stanolind Oil & Gas Co., has been transferred to Fort Worth from Oklahoma City and promoted to division seismograph supervisor, replacing **Dr. Karl Dyk,** who is now seismograph supervisor in the Tulsa offices.

L. H. Butterworth, assistant general foreman in the light-oils division of the Whiting, Ind., refinery of Standard Oil Co. (Ind.), will be promoted February 16 to assistant general superintendent of the company's Casper, Wyo., refinery. Butterworth joined Standard of Indiana in 1937 as a chemical engineer in the research department at Whiting. In 1942 he was transferred to the manufacturing department as an assistant general foreman in the light-oils division at Whiting.

Robert M. Cole, chief engineer of the engineering department of Shell Development Co. at Emeryville, has been named department head of experimental plants. Other personnel changes in the development company include: **Richard L. Iglehart,** assistant chief engineer to chief engineer to succeed Cole; **Sumner H. McAllister,** associate director of experimental plants at Emeryville to associate director of petroleum technology; **James M. Mullen,** engineer to assistant chief engineer in the engineering department, and **Fred M. Nelsen, Jr.,** laboratory assistant to junior chemist.

W. L. Connelly, chairman of the board, Sinclair Prairie Oil Co., Tulsa; **W. H. Ferguson,** vice president, Continental Oil Co., Denver; **E. J. Sullivan,** and **C. B. Richardson,** independent operators of Casper, Wyo., recently received silver life-membership plates from the Rocky Mountain Oil and Gas Association. These are the only men now active in the oil industry who have been members of the association since its origin.

Gaynor H. Langsdorf, manager of technical service for the manufacturing department, Standard Oil Co. of California, has returned to San Francisco after visiting points in the East and Southwest.

Hugh A. Braly, Stanolind Oil & Gas Co., has been promoted to junior engineer and transferred to Imperial, Tex., where he will be in charge of the area office.

Samuel Butler, Sr., Denver, has been elected president of Sharples Oil Corp., wholly owned subsidiary of the Sharples Corp. Headquarters of the new company are in Denver.

George E. Crosby, Stanolind Oil & Gas Co., has been promoted to field engineer at Wink, Tex., succeeding **Walter D. Powers,** now associated with Sid Richardson interests.

Raymond D. Shrewsbury, inventor of the Shrewsbury subsea drilling column and designer of seismograph shot-hole drilling units, has joined the factulty of the University of Tulsa as assistant professor of petroleum and production engineering.

Charles Hansen, drilling foreman at Ventura, Calif., for Shell Oil Co., Inc., has been transferred to Bakersfield. Other changes in Shell's production department include: **Victor S. Clay,** junior engineer, from Los Angeles to Ventura; **Clarence Leslie,** head roustabout at Bakersfield to construction and maintenance foreman; and **William E. Spear,** from mechanical engineer at Long Beach to division construction and maintenance foreman at Ventura. Changes in Shell's manufacturing department include: **C. W. W. Johnson,** promoted to zone supervisor of the Martinez refinery, and **H. A. Davenport,** junior engineer, transferred from the Wilmington refinery to San Francisco.

Frank J. Spuhler has been made foreman of the isobutylene-extraction units at the butyl-rubber plant of Humble Oil & Refining Co.

L. P. Salter has been promoted to shop-zone supervisor in the Baytown refinery of Humble Oil & Refining Co. **W. W. Harris, Jr.,** succeeded Salter as Zone 1 supervisor.

William J. Goldston, independent oil operator, and **R. C. Gwilliam,** vice president and manager of the Houston division of Ohio Oil Co., have been elected directors of the City National Bank, Houston.

J. Howard Barnett, Stanolind Oil & Gas Co., has been elected president of the Casper, Wyo., Engineers Club. Other new officers are **James D. Anderson,** Ohio Oil Co., vice president, and **M. P. Tixier,** Schlumberger Well Surveying Corp., secretary-treasurer.

Harold F. Ormston, supervisor of transportation and the material distribution division of Humble Oil & Refining Co.'s production department in Houston, has resigned to enter the transportation business. Other production department changes include: **N. B. Robins,** assistant chief clerk of the East Texas division, transferred to the production operating department, Houston; **Rex Williams,** assistant chief clerk of the Louisiana division, transferred to the East Texas division to succeed Robins; and **M. B. Donnell,** assistant chief clerk, Southwest Texas division, transferred to the Louisiana division to succeed Williams.

W. E. Leroux, division engineer at Seminole, Okla., has been transferred to the Tulsa offices of Carter Oil Co. as assistant to the production manager. Other recent Carter changes include: **Jack Gardner,** district foreman, from Great Bend, Kans., to Wilson, Okla.; **William A. Crutcher,** scout, from Mattoon, Ill., to Tulsa; **Wilmer M. Case,** foreman, from Magnolia, Ark., to Rodessa, La.; **Medford G. Parker,** junior geophysicist, to Magnolia, Ark., and **James L. Rogers,** division engineer, from Carmi, Ill., to Seminole, Okla.

Bernard H. Lasky, engineer and geologist, has resumed his consulting practices, opening an office in Houston.

J. C. Hamilton, vice president, and **P. J. Erickson, Jr.,** petroleum engineer, Arkansas - Louisiana Gas Co., have been elected president and secretary of the Shreveport Community Chest Fund for 1947.

S. V. White has been made head of the geological department of Panhandle Refining Co., at Wichita Falls, Tex. He formerly was geologist for Consolidated Oil Co.

E. M. Borger, Peoples Natural Gas Co., has been elected president of the Pennsylvania Natural Gas Men's Association. Other new officers are **D. P. Hartson,** vice president; **P. L. Kesel,** secretary-treasurer; and **Mark Shields,** executive secretary.

A. C. Sailstad has resigned as sales manager of Leonard Refineries, Inc., Alma, Mich., to become assistant general manager of the crude-oil purchasing department of Standard Oil Co. (Ind.) and manager of crude-oil purchasing for Stanolind Oil Purchasing Co.

Willis G. Meyer and **Leo A. Achtschin** have formed a partnership and opened an office in Dallas as consultants in petroleum geology and economics and as appraisers of oil companies and properties.

Dr. W. S. Pike, Shell Oil Co., Inc., district geologist, working out of Baltimore, Md., has been transferred to Tallahassee, Fla., as district geologist for that area.

Dr. Cecil L. Brown, director of the Esso Laboratories of Standard Oil Co. of New Jersey, Louisiana Division, has been elected chairman of the Baton Rouge section of the American Chemical Society.

Newly elected officers of the Petroleum Engineers Club of Dallas: C. D. Deschner, Continental Supply Co., chairman, membership committee; T. S. Bacon, Lone Star Gas Co., chairman, program committee; D. A. Jordan, Atlantic Refining Co., president; H. J. Gruy, DeGolyer & MacNaughton, chairman, arrangements committee; and R. U. Maddox, Big West Drilling Co., secretary-treasurer. One of the most active engineers' groups in the country, the Dallas club hears outstanding speakers each Friday noon at Hotel Adolphus

R. M. GOODING

Richard M. Gooding, petroleum chemist in the Bureau of Mines experiment station at Bartlesville, Okla., has been transferred to the bureau's main offices in Washington to serve as assistant to **Chief Engineer R. A. Catlell,** in charge of petroleum chemistry and refining matters. Gooding joined the bureau in 1941 and during the war worked on the development of analytical methods for evaluating components of aviation fuels.

SHIFTS—

Clyde L. Caldwell, engineer, Houdry Process Corp., Los Angeles, to Long Beach, Calif.; **John S. Baker,** geologist, Shell Oil Co., Inc., Alamagordo, N. M., to Carlsbad, N. M.; **Frank Gray,** superintendent, Anderson-Prichard Oil Corp., Hobbs, N. M., to Yukon, Okla.; **Roy C. Jeter,** engineer, Western Gas Co., Jal, N. M., to Durango, Colo.; **Paul M. Wiley,** engineer, The Texas Co., Freer, Tex., to Houston.

Otis B. Hocker, foreman, The Texas Co., Goliad, Tex., to Houma, La.; **C. S. Johnson,** foreman, The Texas Co., Monahans, Tex., to Kermit, Tex.; **Charles J. White,** superintendent, Frontier Chemical Co., Seagraves, Tex., to Denver City, Tex.; **George Ford,** superintendent, Warren Petroleum Co., Sinton, Tex., to Gladewater, Tex.; **Ray Fellows, Jr.,** engineer, Stanolind Oil & Gas Co., South Houston, Tex., to Alvin, Tex.; **H. E. Treichler, Jr.,** engineer, The Texas Co., Tomball, Tex., to Pearland, Tex.

Robert L. Hoss, engineer, Phillips Petroleum Co., Austin, Tex., to Tulsa; **Philip S. Schoeneck,** geologist, Atlantic Refining Co., Dallas to Tyler, Tex.; **H. H. Plummer,** engineer, The California Co., Harvey, La., to New Orleans; **John E. McCall,** geologist, The California Co., Houma, La., to La Junta, Colo.; **Jack P. Anderson,** superintendent, Cities Service Refining Corp., Lake Charles, La., to Baton Rouge; **James R. Harms,** foreman, The Carter Oil Co., Dermott, Ark., to Warren, Ark.

J. M. Lilligren, geologist, Sinclair Prairie Oil Co., Dover, Del., to Fredericksburg, Va.; **A. H. Hensick,** foreman, Mabee Oil & Gas Co., Effingham, Ill., to Mount Carmel, Ill.; **C. Z. Leonard,** geologist, Higginsville, Mo., to Provencal, La.; **Robert E. Dunn,** engineer, Tidioute, Pa., to Salem, Ill.; **Jack H. Maguire,** engineer, The Texas Co., Rangely, Colo., to Denver; **A. L. Smith,** engineer, Great Lakes Pipe Line Co., Glenville, Minn., to Osceola, Tex.

Equipment Men in the News

Swaney President of Kerotest

W. G. SWANEY

Walter G. Swaney was elected president of Kerotest Manufacturing Co., Pittsburgh, and Stanley J. Roush became executive vice president at a special meeting of the board of directors on January 23. Edward G. Mueller, former president, became chairman of the board. Other officers elected included A. W. Anderson, works manager and director of purchases, and Ralph E. Lane, secretary-treasurer. Walter Swaney was one of the original members of the firm, having started as a clerk in 1905, and helped introduce kerosene-hydrostatic testing of valve castings which was so successful that the corporate name was changed in the middle twenties to Kerotest Manufacturing Co.

Krausse Plant Purchased by Reed Roller Bit

Reed Roller Bit Co., Houston, has announced purchase of the plant of Krausse Tool & Engineering, Inc., 5125 Clinton Drive, Houston. Amount of purchase price was not revealed. Dow Warren, assistant to the president of the Reed plant, said the Krausse plant will be operated as a division of Reed Roller Bit Co.

The Krausse company is engaged in manufacturing tools and tooling and sheet-metal products. Louis M. Krausse is president. Warren said Reed did not buy the company, but the plant. Krausse said he has no plans for the immediate future. The Krausse plant has operated in Houston for 9 years, and the company had recently completed a new office building and shop building at a cost of about $125,000, exclusive of machinery and equipment.

Crouse-Hinds Celebrates Fiftieth Anniversary

Crouse-Hinds Co., Syracuse, was formed 50 years ago January 17, and to celebrate its fiftieth anniversary the company has prepared a booklet entitled "Fifty Years," for members of the organization. The story of the company is told in this anniversary book—including the founding and growth of the company by the present owners, and the service record evidencing the loyalty of its employes.

Spang-Chalfant Reorganizes District Office

The Spang-Chalfant Division of The National Supply Co. will reorganize its present suboffice in the Morris Building, Philadelphia, as a complete district office, according to an announcement by George E. Clifford, vice president of the company. William H. Taylor will be manager of the district, which will cover eastern Pennsylvania, Maryland, Delaware, southern New Jersey, District of Columbia, Virginia, and eastern North Carolina.

Dyer Establishes Agency

James E. Dyer has opened an office in the Thompson Building, Tulsa, and will operate a manufacturers' agency by the name of James E. Dyer Co. His sales organization will represent the following manufacturers: Paulsen-Webber Cordage Corp., New York; Warren Belting Co., Worcester, Mass.; Keystone Carbon Co., and Precise Products Co. These companies offer wire rope, fiber rope chain, canvas, fittings, leather belts, powder metallurgy, precision portable miller-grinders, etc., to the oil industry and industrial establishments in the states of Oklahoma, Kansas, and Texas.

Miller and Lowell Join Moorlane

Moorlane Co., Tulsa, announces the appointment of two men to its staff as special-products representatives. W. W. (Woody)

W. W. MILLER

J. F. LOWELL, JR.

Miller will devote his time to the sale of products manufactured by Mexico Refractories Co., Belmont Packing Co., Cup-Lok Packing Co., and the plug-valve lubricant line of Delta Sales Co. J. F. Lowell, Jr., will handle the specialized lines of Allegheny Ludlum tool steels, Dallett pneumatic tools and accessories, Harper stainless steel bolting, and Moorlane alloy and carbon-steel bolting.

Coutant Joins Barium Steel

Jay Gould Coutant, fuel engineer, has become associated with Barium Steel Corp. and will supervise the fuel and refractory activities of the corporation subsidiaries in the steel and allied industries.

Watkins Celebrates Warehouse Opening

E. A. Watkins, president of Watkins, Inc., Wichita, announces the opening of new sales offices and warehouse of its heavy hardware and industrial-supplies division. This new warehouse was specially designed to expedite handling of supplies and equipment, and to provide fast, efficient service. It occupies over 31,000 sq. ft. of floor space and is provided with ample trackage.

To celebrate the opening Watkins is inviting the oil industry to attend an "open house" which will be held February 15 and 16 at the new location, 721 West Second Street, Wichita. About 2,500 visitors are expected to see the displays and demonstrations of the latest-type equipment. These demonstrations will be handled by representatives of leading manufacturers, and by the company's sales force.

Marley Opens Los Angeles Office

Marley Co., Inc., Kansas City, Kans., manufacturers of spray nozzles, cooling towers, and other water-cooling equipment, announces the opening of a Los Angeles office at 303 Continental Building, 408 South Spring Street. Arthur C. Elias, factory engineer, supervised the opening of the branch office which will serve greater Los Angeles and southern California.

Ideco Supply Store at Hitschmann

The new Ideco supply store, which was erroneously reported in the January 25 issue to have opened at Hutchinson, Kans., is located at Hitschmann, Kans.

Officers of the Houston Nomads to serve during 1947 were installed at the recent dinner dance given in the Rice Hotel. Nearly 500 Nomads and their guests attended. Charles W. Thornhill, Thornhill-Craver Co., retiring president and regent, was presented with a gift in recognition of his work during the past year. The officers shown above are: Seated—Charles E. Richards, Gray Tool Co., president; George E. Tyson, Jones & Laughlin Co., vice president; C. L. Clausel, A-1 Bit & Tool Co., secretary-treasurer; H. J. Wood, Lebanon Steel Foundry, assistant secretary-treasurer; Jack Barnes, Trinity Portland Cement Co., sergeant-at-arms. Standing—Edwin Ross, Baash-Ross Tool Co., deputy sergeant-at-arms; Floyd L. Senter, National Tank Co., regent; Thornhill, the retiring president and regent; and Harry E. Estes, Reed Roller Bit Co., executive secretary